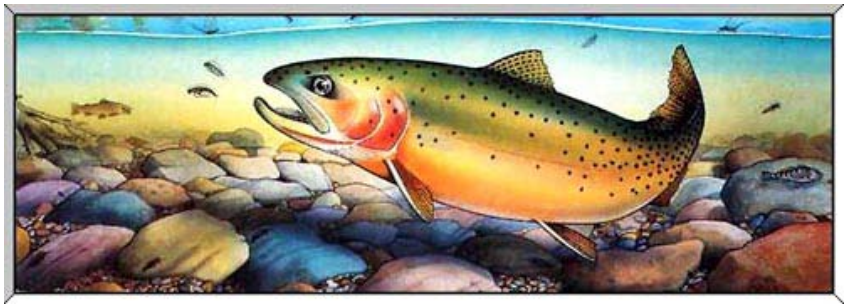
Adopt-A-Trout



Montana Fish, Wildlife and Parks sponsors the Adopt-A- Toru program in partnership with The Blackfoot Challenge, the U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program; and the Big Blackfoot Chapter of Trout Unlimited. The Clark Fork Watershed, including the Blackfoot River is home to many unique fish and wildlife species, including native westslope cutthroat trout and bull trout. Conservation education and habitat restoration efforts are currently underway to restore and protect these native fish. This innovative project links data of fish migrations collected by fisheries biologists to teachers and students in the Blackfoot Watershed.

For Further Information, Please Contact:

David Schmetterling
Montana Fish, Wildlife and Parks
3201 Spurgin Road
Missoula, Montana 59801
dschmetterling@mt.gov

Elaine Caton
P.O. Box 92
Ovando, MT 59854
woodpecker@blackfoot.net

Tina Bernd-Cohen
Executive Director, Blackfoot Challenge
Blackfoot Challenge
P.O. Box 563
Helena, Montana 59624
406-442-4002
blkfootchallenge@aol.com

Greg Neudecker
USFWS, Partners for Fish and Wildlife,
Benton Lake National Wildlife Refuge,
922 Bootlegger Trail, Great Falls,
Montana 59404
greg_neudecker@fws.gov

Adopt-A-Trout

What is Adopt-A-Trout? This innovative project links data of fish migrations collected by fisheries biologists to teachers and students. Although the project initially focused on native trout species (westslope cutthroat and bull trout), additional species (i.e. largescale suckers and northern pike) have been added so that students can be involved in current research programs and a variety of interesting topics.

To help educators utilize this vast information, spark the interest and imagination of their students and enrich their current curriculum, we have developed a unit that organizes research and background information and supports the website and field trip components of the program.

This Adopt-A-Trout Unit is overflowing with a broad range of interesting and challenging activities, projects, and ideas that are cross-curricular (i.e. language arts, science, social studies, mathematics, and the creative arts) and designed to enhance and reinforce your current curriculum.

This curriculum was developed by participating Adopt-A-Trout teachers:

- **Linda Hicks and Betsy Sharkey of Potomac School**
- **Alyssa Brumder of Lincoln School**
- **Linda Hugulet of Ovando School**

and by

- **Elaine Caton, Education Coordinator, The Blackfoot Challenge**
- **David Schmetterling, Montana Fish, Wildlife and Parks**

CONTENTS

What will students learn in the AAT program?

The following topics will be covered during the program, through field experiences, discussions with fisheries biologists, background information you share with your students, web site use, and curriculum activities:

1. Fish species native to western Montana
2. Reasons that native fish are important
3. Habitat needs of native fish
4. Non-native fish species in western Montana
5. Reasons that non-native, invasive fish species are a problem
6. Reasons fish migrate
7. Advantages and disadvantages to migrating
8. Reasons that fish return to the stream in which they were reared to spawn
9. How Milltown Dam and other dams affect fish
10. The legal status of bull trout and westslope cutthroat trout in Montana
11. Factors that led to these fish being given this status
12. What radio telemetry is
13. Kinds of information biologists can gather using radio telemetry
14. What Fish, Wildlife and Parks and other people are doing to help native fish

BENCHMARKS:

(Adopt-A-Trout curriculum's correlation to the Montana Content Standards)

PRIMARY

- **Examine, describe, compare and classify tangible objects in terms of common physical properties. (Science, Act. 2)**
- **Explain cause and effect relationships in living systems and non-living components within ecosystems. (Science, Act. 5)**
- **Create and use a classification system to group a variety of plants and animals according to their similarities and differences. (Science)**
- **Use the number system by counting, grouping and applying place value concepts. (Mathematics, Act. 2)**
- **Collect, organize and display data. (Math, Act. 2 & 3)**
- **Construct, read, and interpret displays of data, including graphs. (Math, Act. 2 & 3)**
- **Provide oral, written, and/or artistic responses to ideas and feelings generated by the reading material. (Reading, Act. 2 & 5)**
- **Read and provide oral, written and/or artistic responses to diverse perspectives, culture, and issues in traditional and contemporary literature. (Reading, Act. 6)**

BENCHMARKS:

Adopt-A-Trout Curriculum's correlation to the Montana Content Standards

INTERMEDIATE

- **Communicates results from a controlled experiment and results are reproducible. (Science, Activities 1 & 5)**
- **Explain cause and effect relationships in living systems and non-living components within ecosystems. (Science, Activities 1 & 5)**
- **Develop models that trace the life cycles of different plants and animals and discuss how they differ from species to species. (Science, Activities 3 & 4)**
- **Collect, organize and display data. (Math, Activities 1 & 5)**
- **Construct, read, and interpret displays of data, including graphs. (Math, Act. 2 & 3)**
- **Develop the process of measuring and concepts related to units of measurement, including standard units (English and metric) and nonstandard units. (Math, Activities 1 & 6)**
- **Select and use appropriate tools and techniques for measurement. (Math, Activities 1 & 6)**
- **Make predictions and connections between new material and previous information/experiences. (Reading, Activity 5)**

BENCHMARKS:

Adopt-A-Trout Curriculum's correlation to the Montana Content Standards

MIDDLE SCHOOL

- **Examine, describe, compare and classify tangible objects in terms of common physical properties. (Science)**
- **Explain cause and effect relationships in living systems and non-living components within ecosystems. (Science)**
- **Create and use a classification system to group a variety of plants and animals according to their similarities and differences. (Science)**
- **Use the number system by counting, grouping and applying place value concepts. (Mathematics)**
- **Collect, organize and display data. (Mathematics)**
- **Construct, read, and interpret displays of data, including graphs. (Mathematics)**
- **Provide oral, written, and/or artistic responses to ideas and feelings generated by the reading material. (Reading)**
- **Read and provide oral, written, and/or artistic responses to diverse perspectives, culture, and issues in traditional and contemporary literature. (Reading)**
- **Apply conventions of standard written English (e.g., spelling, punctuation, usage) appropriate for grade level and purpose. (Writing)**
- **Share and publish a legible final product. (Writing)**
- **Apply the elements of line, shape, form, color, space, value and texture to compose works of art and the principles of design—pattern, balance, contrast, rhythm, proportion, economy, movement, dominance. (Art)**
- **Develop basic skills and procedures needed to operate various technologies. (Technology)**
- **Develop and present a project using technology. (Technology)**

Adopt-A-Trout

Teacher Participation and Responsibilities

- **Field Trips**
  Attend field trips and help arrange additional adult supervision for each field trip.

- **Transportation**
  Arrange transportation for field trips.

- **Classroom activities**
  Provide program leaders with a brief description of what you do each week.

- **Host a visit**
  Program leaders would like to visit your classroom once while AAT activities are taking place—not to critique or assess, but to see how it works in the classroom and get ideas for the future. Please help by letting us know when we can visit during program lessons!

- **Question of the Week**
  Submit questions of the week to the website.

- **Evaluations**
  Complete evaluations forms that will be provided during the program:

- **Curriculum**
  Share lessons or activities that you develop related to the program through a curriculum packet.

- **Program Development**
  Give thoughtful input on how you think the program could better serve you and other teachers in the long-term.

CLASS ACTIVITIES RELATED TO AAT

Please note the activities you do with your students related to AAT, so that we can assess whether this program is successful in stimulating classroom lessons beyond the field trips. At least write down the name (or what you call it) of the activity and whether you felt it was worthwhile or not; if you can, a brief description of any activities you did that were not in the binder would be very helpful as well. Keeping track of which activities are done is very important to the program, and we have no other way of showing funders and other supporters that the program "works". THANK YOU for spending a few minutes of your busy day on this!!!!

- **Lesson/activity**: _____

Successful (would you do it again or recommend it)? Yes No Comments: _____

Description (if not in AAT curriculum binder):

_____

_____

- **Lesson/activity**: _____

Successful (would you do it again or recommend it)? Yes No Comments: _____

Description (if not in AAT curriculum binder):

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- **Lesson/activity**: _____

Successful (would you do it again or recommend it)? Yes No Comments:
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Description (if not in AAT curriculum binder):

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BACKGROUND INFORMATION

Radio Telemetry

What is Radio Telemetry?

In its broadest sense, telemetry can be defined as the art and science of conveying information from one location to another. With radio telemetry, radio signals are utilized to convey that information.

The tracking method of choice for most freshwater research is radio telemetry. Biologists can equip trout with amazingly small radio transmitters and track their movements and behavior with the aid of receivers. Radio telemetry system designs commonly utilize aerial antennas to establish "listening" zones to detect signals.

How Do They Do It?

Milltown Dam is equipped with a radial gate that can be opened up to allow water to bypass the hydroelectric facility and flow directly downstream. Dam managers use the radial gate as a management tool to release excess water and to clean debris from the dam. Fisheries biologists use this same site to capture upstream migrating fish trapped in the small concrete depression below the radial gate. Bull trout and westslope cutthroat trout are attracted to this site, and once the radial gate is closed, the fish become stranded and are netted by the biologists.

Captured Fish are then Anesthetized

Captured fish are anesthetized (60 mg/L tricaine methanesulfonate [Finquel™]), and placed on their dorsum in a V-shaped operating table. During surgery their gills are irrigated with dilute Finquel™ to maintain unconsciousness. Incisions are made along the linea alba immediately anterior to the pelvic girdle and a transmitter is inserted into the body cavity. An external antenna is passed through the body wall posterior to the pelvic fins. Radio transmitters do not exceed 2% of fish weight and range in size from 6.0 to 8.9 g in air. All bull trout are implanted with 8.9 g transmitters to minimize stress despite that larger transmitters could be used. For this size radio transmitters, transmitter life ranges from 237-344 days, and transmitters emit a signal 5 seconds at 150 MHz. Incisions are closed with surgical skin staples.

Surgical tools (including staple gun and staple remover) are sterilized in dilute Betadine™ and rinsed with 0.9% saline solution prior to each surgery. New surgical blades, latex gloves and sutures (silk or steel) are used for each surgery. After surgery, fish are placed in a live car in the river to regain consciousness and equilibrium, and then released.

In summary, biologists put the captured fish to sleep using a prescribed drug. A small cut is made on the fish's belly, and a small radio transmitter is placed inside. This small radio has an wire antenna attached to it which is located outside of the fish's body. The biologist then uses stitches to close the opening which prevents the radio transmitter from falling out of the fish. After surgery, the fish are kept in a holding pond until they fully recover from the surgery and are then released back in the river above the dam.

Using Radio Telemetry

Fish are located at least three times per week during migrations and more frequently (up to seven times per week) during spawning to determine what tributaries are used for spawning and other migration information. Locations of radio-tagged fish are made from the ground using a truck mounted omni-directional whip antenna, by hand with a three-element antenna, or from a small fixed wing aircraft with a three element antennae mounted on a wing strut.

Why Do Biologists Track Fish?

Biologists are using radio telemetry as part of a study to assess the effects of Milltown Dam on native fluvial bull trout and westslope cutthroat trout populations in the Upper Clark Fork River. The goals of this study are to restore connectivity (access) to the Upper Clark Fork River and Blackfoot River from below Milltown Dam; to determine the effectiveness of trapping and hauling fish over the dam to restore connectivity; to restore spawning fish to upriver populations; to better understand the impacts of Milltown Dam on upriver fish populations; to better understand fish movements; to gain a better understanding on habitat requirements; to help locate critical spawning streams; and to help us identify human impacts to native fish such as undersized culverts and unscreened irrigation ditches.

In the photo, Ron Pierce, a fisheries biologist, is pointing to a bull trout redd in Monture Creek. Radio telemetry projects help biologists find critical spawning sites in tributaries such as Monture Creek. Trout redds (or spawning beds) are areas where female fish lay on their sides and flap their caudal fins or tails making a depressional bed in the gravel. After spawning, the pair then covers their eggs with gravel from immediately upstream the same way they made the nest. This process turns the gravel upside down exposing the reddish gravel from underneath. Within a few weeks of spawning, the red gravel begins to turn green from algae growth and the redd blends in with the surrounding gravel.

Montana Trout

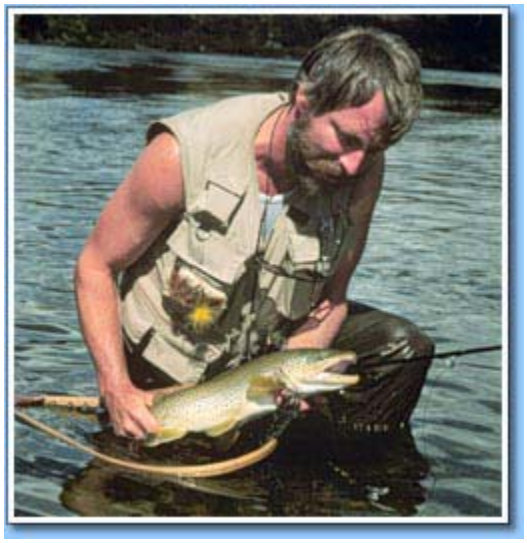
Montana is home to a lot of different species of fish, but by far the most famous of these is the trout. Every year, people from all over the world come to Montana to fish for trout. Now the word trout is a kind of funny thing scientifically, it means a certain species of fish that come from Eurasia. But commonly people use the word "trout" to refer to two other groups of fish, the salmonids and the char (see trout species chart).

Trout Species Chart

True Trout	Salmonid	Char
Brown	Cutthroat	Brook
	Golden	Bull
	Rainbow	Lake

Montana's trout species include Rainbow, Brown, Brook, Lake, Bull and Cutthroat Trout. Cutthroat, Rainbow, Bull, and Lake Trout are Montana's native trouts, which means that these species were discovered living in Montana's waters, although many of these species were introduced into waters that were not their native range. The fossil record indicates that native trout have lived in our creeks and rivers for a long time. Other fish, like grayling and mountain whitefish, are also native to Montana and are close genetic relatives of the salmonids. European settlers and their descendants introduced the other species of trout in Montana. These include golden, brown, and brook trout.

Trout are opportunistic feeders, which means they will eat a lot of different things to stay alive. All trout particularly like to feed on aquatic insects, like the larval-stages of mayflies and dragonflies (called "nymphs") and freshwater crustaceans like scuds. They also like to eat insects that live on land but sometimes fall into the water like grasshoppers and ants. Large adult trout can be "piscivorous" a Latin word that means "fish-eating".



Trout spawn--lay eggs--to reproduce themselves. For Rainbow and Cutthroat Trout, spawning happens in the spring, the fish start beefing up on food in the early spring and then begin laying eggs in late spring. Brown, Bull, Lake, and Brook Trout, on the other hand, all spawn in the fall. Trout will actually search out a tributary, a smaller stream or creek that runs into the river or lake they normally live in, to spawn.

Young trout are particularly vulnerable to being eaten by other fish when they hatch because of their small size. For this reason young trout will live in the tributary in which they were born and tend to seek out shallow water until they get large enough to fend for themselves in larger waters. A trout grows in relation to the environment it lives in. For example, a trout living in a river with good mineral content that supports lots of aquatic organisms will grow much faster that a trout living in an alpine lake where the winter lasts much longer. Water quality is also important for the growth of trout. A stream free of pollution and other environmental impacts will support lots of large healthy trout, while a stream polluted by industry will not support hardly any healthy trout.

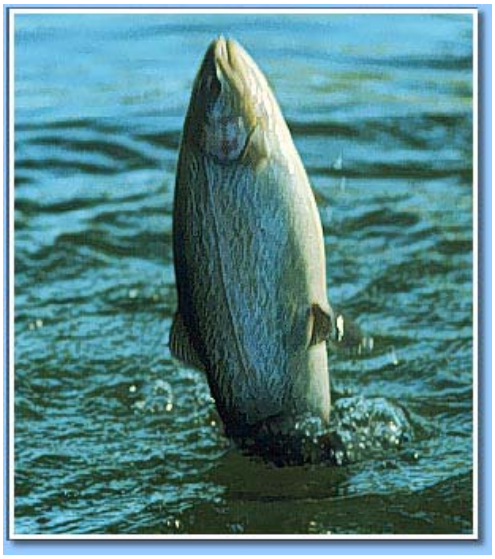
Trout are a very popular "game" fish. The most popular trout to fish for in Montana's rivers are Rainbow and Brown Trout. Fishing methods vary with the season, the type of water, and the fisherman's personal preference. Fly, spin, and bait fishing are all popular techniques, although the use of bait is restricted on some streams. In general, most fly fishers use rods that are eight and a half or nine feet long, while spin and bait fishers use shorter rods with six to ten-pound test line.

Wading is the most common technique along streams and rivers. Hip boots are handy on small streams, but chest waders are needed on the large rivers. Felt-soled

wading shoes or boots improve traction on slippery stream bottoms.

Float fishing is increasingly popular on the largest rivers, but some rivers can be dangerous in high water. Inexperienced floaters always should inquire locally about river conditions and possible hazards. The best floating craft are McKenzie-style drift boats or high-quality inflatable rafts with rowing frames. Motorboats are allowed on most lakes and on some larger rivers; smaller lakes and rivers may have restrictions on motorized watercraft. Motorboat operators should always be alert for fast-moving storms and strong winds, especially on large reservoirs such as Fort Peck. Children under twelve must wear a personal flotation device (PFD) at all times while boating or rafting; adults are encouraged to wear PFDs.

Over the years, some trout have been placed in danger by dams and other habitat alterations, the introduction of non-native fish, disease, and over-fishing. The Westslope Cutthroat Trout, Yellowstone Cutthroat Trout, and Grayling that once filled western Montana waters are now scarce in most of their native ranges. Recognizing the need to save Montana's native species, state fishery biologists have listed Westslope Cutthroat Trout, Yellowstone Cutthroat Trout, and Grayling as "species of special concern." Research and management programs are now being developed to save these fish. The cooperation of fishermen and industry in complying with special regulations governing Montana's native fish will be vital to these trouts' survival.



Bull Trout

Salvelinus confluentus

Description:

- Pale yellow spots on back
- **No black** markings
- Dorsal fin translucent
- Red or orange spots on side
- White edgings on fins

Habitat: Prefers large coldwater streams and lakes (some smaller waters)

Range: Western Montana (Central to North)

Origin: Native to Montana

Interesting Facts:

A Threatened Species

Separate species from Coastal Dolly Varden

Spawn in fall

Can breed with Brook Trout creating sterile hybrid

****Sensitive species**-Good indicator fish (for a healthy stream)
Can't tolerate high sediment or polluted water

Tail fin slightly forked

Westslope Cutthroat

Oncorhynchus clarki lewisi

Description:

- Small irregular shaped black spots on back and upper sides (few to none on snout or lower sides)
- Spots more dense toward rear of fish
- Red or orange cutthroat slashes (one on each side--weak on juveniles)

Habitat: Cold, clear streams and lakes

Range/Origin: Native to Montana west of the Continental Divide

Interesting Facts:

Designated a Fish of Special Interest

Serious reduction in numbers due to hybrid (cross breeding with rainbow) and loss of habitat

Montana State Fish

Average size 6-16 inches

Spawn in spring and lower sides turn red

Tiny teeth on floor of mouth behind tongue

Rainbow Trout

Oncorhynchus mykiss

Description:

- Red or pink mid-side band often present
- Many **S**mall irregular shaped black spots on head, body, dorsal fin, and tail.

Habitat: Clean, cool lakes and streams

Range/Origin: Most hatchery based in origin. Small number of natives in Upper Kootenai River—these have been designated as *Fish of Special Interest*

Interesting Facts:

Number one game fish in Montana

Tail fin slightly forked to squarish

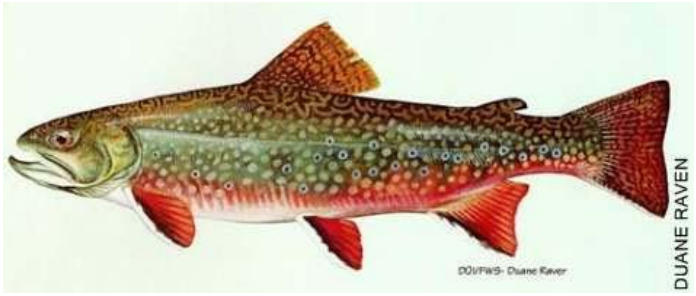
Spawn in spring

Fair well in many environmental conditions (ponds, reservoirs, lakes, etc.)

Breed with cutthroat to create hybrid

Brook Trout

Salvelinus fontinalis



Description: Red spots with blue halos

Wavy lines on back

Dorsal fin has black markings

White leading edge on fins set off by black line

Habitat: Cold, clear well-oxygenated streams and lakes

Origin: Introduced-Non-Native

Interesting Facts:

Predatory

Tail fin slightly forked to squarish

Spawn in spring

Breed with cutthroat to create hybrid

Brown Trout

Salmo trutta (different genus)

Description: Background color usually golden brown

Black or brown spots often with light halos (on gill covers too)

May or may not have red or orange spots on sides with light halos

Habitat: Valley streams, rivers, lakes and reservoirs

Origin: Introduced to Montana

Interesting Facts:

Tail fin squarish with few to no spots

Spawn in fall

Hardy trout, fair well in many environmental conditions

Lake Trout

Salvelinus namaycush

Description: Numerous light spots (no red or orange)

White leading edge on fins

Fins may have orange cast

Habitat: Deep, cold lakes and reservoirs

Origin: Native to Montana

Interesting Facts:

Major game fish

Tail fin deeply forked

Broadcast spawners (a rarity in trout)

Is a “Char” (same genus as bull and brook trout)

Longnose Sucker

Catostomus catostomus

Description:

Back, upper sides, and head to below the eye dark olive to slate

Underparts white or yellow

Breeding males are nearly jet black on upper half of head and body and may have red midside band

Habitat: Cold, clear streams and lakes; sometimes moderately warm waters and turbid waters. Spawns over loose gravel beds in riffle areas.

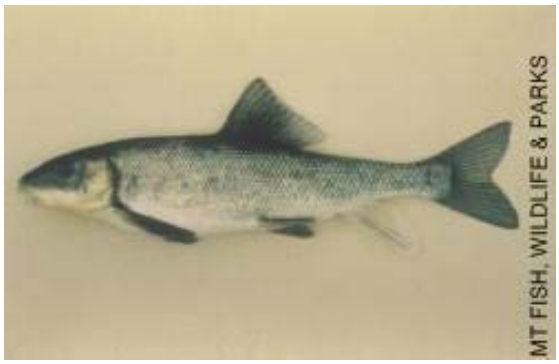
Origin: Native to Montana

Interesting Facts:

Diet includes considerable algae, midge larvae, and most aquatic invertebrates.

Important food source for predators such as osprey, eagles, otters, and others.

Largescale Sucker
Catostomus macrocheilus



Description:

Back and sides dark olive gray, changing abruptly to white or yellowish on underside

Habitat: Found in both streams and lakes. Spawns in gravel riffles with strong current or along lake margins

Origin: Native to Montana

Interesting Facts:

Eats almost any available organism found on the substrate.

Have decreased in abundance below Libby dam due to colder water temperatures delaying spawning.

Eggs stick to the substrate and hatch in 2 weeks.

Northern Pike
Esox lucius

Description:

Long flat snout like a duck's

Large mouth with many sharp teeth

Long body is green with pale spots and its eyes are yellow

Dorsal fin is back near its tail

Habitat: Bays of lakes and reservoirs; pools and backwaters of streams.

Origin: Native to the Saskatchewan River drainage in eastern Montana only; introduced widely in western Montana.

Interesting Facts:

Feed almost exclusively on fish after reaching 3-4 inches in length. Other vertebrates also taken. Use vegetation as hiding spots to ambush prey.

Because of their voracious fish-eating habits they can literally eliminate their food supply in only a few years. Widespread illegal pike introductions in western Montana have become a fishery manager's nightmare.

They broadcast their eggs over flooded shoreline vegetation. The eggs adhere to the vegetation until the young are ready to swim on their own.

Northern pike can grow to nearly 40 pounds in Montana and provide a truly outstanding sport and food fish in the appropriate waters.

Trout migration and spawning

1. **Why do fish migrate?**
   Fish will migrate for a variety of reasons, for example:
   • to escape seasonally unfavorable conditions (such as warm river temperatures in the summer),
   • to exploit seasonally available resources (such as food),
   • to provide rearing areas for future generations, and
   • for dispersal.
2. **What are the advantages and disadvantages of migrating?**
   Advantages to migrating include being able to use a lot of resources and being able to survive if there are catastrophic events.
   Disadvantages include complexity of the migration that may put individuals at risk.
3. **Why do westslope cutthroat trout migrate and spawn during high flows?**
   Westslope cutthroat trout spawn at high flows to gain access to areas that they may not be able to reach during low flows (like upstream of intermittent stream reaches). Also, the high water and turbidity (muddy water) provide cover for them while spawning in small streams.
4. **How do fish "home" or guide themselves?**
   Fish use several different senses for navigation, such as their olfaction (their sense of smell), geomagnetism (like salmon in the ocean), and at a river reach scale they can recognize and remember stream features, such as certain pools and riffles.
5. **Why is it important for a fish to return to a stream to spawn?**
   Westslope cutthroat trout and bull trout almost always return to their natal stream (or stream where they reared) to spawn. This area was a successful place for them (because they are still alive) so chances are this area will be good for their offspring as well.
6. **What are the spawning habitat requirements for westslope cutthroat trout and bull trout?**
   Westslope cutthroat trout spawn in many different sizes and types of streams, ranging in size from 0.5m to 15m wide, but the habitat where they spawn in those streams is very similar. Westslope cutthroat trout spawn in clean loosely deposited large gravels at the downstream end of pools (tail spill) in relatively high water velocity. These features allow for a lot of water movement though the redd (nest) and the eggs.

Bull trout require cold water and usually ground water or springs in the redd, they usually spawn in low gradient shallow areas, with the same size or larger substrates than westslope cutthroat trout.

7. What are the life-history strategies of westslope cutthroat trout and bull trout?

Westslope cutthroat trout and bull trout both have three different ***life history strategies***, or ways of going through their life cycle: resident, fluvial and adfluvial:

Resident fish live in only one stream their entire life, and may remain only in a 10m portion of that stream.

Fluvial fish will spawn in small tributaries and the young will rear there for up to 4 years before migrating to a river to mature. Once mature, the adults will return to the same tributaries to spawn.

Adfluvial, are similar to fluvial, but mature in lakes instead of rivers.

8. How does Milltown Dam (or other dams) affect bull trout or westslope cutthroat trout?

Dams are barriers to upriver migrations and sometimes limit downstream movement. They limit a fish's access to upriver habitat. Dams also change fish habitat, which may benefit other species (like northern pike in Milltown Reservoir) and not provide benefits to bull trout or westslope cutthroat trout.

9. What is the official status of bull trout and westslope cutthroat trout in Montana?

Bull trout westslope cutthroat trout are both listed as species of special concern in Montana by Montana Fish, Wildlife and Parks and the American Fisheries Society. Bull trout receive federal protection as a threatened species under the endangered species act. Populations of both species currently occupy areas that are much smaller then their historical distribution.

10. What factors have led to the status of westslope cutthroat trout and bull trout in Montana?

Westslope cutthroat trout and bull trout populations have declined in numbers and size in Montana as a result of:

- over harvest (by anglers),
- upstream passage barriers which limit their migration (such as dams and irrigation diversions),
- habitat loss and degradation (overgrazing and human-made channel adjustments), and
- competition and hybridization with exotic (introduced) fishes (such as brown trout, rainbow trout, brook trout and Yellowstone cutthroat trout).

Fascinating facts about *NORTHERN PIKE*

Who are they?

Northern pike are in the *pike* family (Esocidae), and other members of this family are pickerels and muskellunge ("musky"). Their Latin or scientific name is *Esox lucius*.

Other names: Pike, northern, pickerel, jack, hammer-handle, slimer

Description:

- A large fish with a long flat snout like a duck's bill and a big mouth with many sharp teeth.
- Its long body is green with pale spots and its eyes are yellow.
- Its *dorsal fin* (the fin on its back) is way back near its tail.
- They grow up to 53 inches long and can weigh 40 pounds

Habitat: Shallow, slow-moving water, such as bays of lakes and reservoirs, and pools and backwaters of streams. They like dense vegetation.

Spawning: They spawn in the early spring, soon after ice comes off lakes (or even under the ice in some lakes), typically from March through May. In Milltown Reservoir, depending on temperature, they will spawn from the end of March to the end of April. They spawn in shallow (< 1.0 meter) water on flooded or submerged vegetation. Their eggs are adhesive and stick to the vegetation. Females typically produce between 10,000 and 100,000 eggs depending on size. Eggs hatch in less than 12 days.

Range: Northern Pike are found in North America, Europe, and Asia. They are native to a very small area of Montana (the Saskatchewan River drainage in eastern Montana), but not to western Montana. They have been *introduced* (put in by people) to waters in western Montana, and are now widespread through out the state.

Lifespan: 14-18 years

Food: They are predators, and mostly *piscivorous,* which means they eat other fish. Their diet switches from insects to mostly fish once they reach about 75mm in length (just after a few months old). They are ambush predators—they hide and dart out to capture their prey.

Other information: Northern pike have been both intentionally and illegally stocked in many states. They are a sought after game fish because of their size, and because they are good to eat. They have also been introduced into many waters to control or eliminate other species like carp or shad.

Impact of introductions: Where they have been illegally introduced, northern pike reduce the numbers of prey species and even eliminate species (from case studies in Wisconsin, Montana, Colorado, and Alaska).

In the Blackfoot Watershed

They were illegally introduced to the Clearwater Lakes in the mid- to late-1980's. From there they gradually moved downstream and reached Milltown reservoir. Biologists first got reports of northern pike in the reservoir in 1998 and by 1999 they were the most *abundant*, or common, fish species in the reservoir.

Why do we care?

Like knapweed or some other non-native species, pike have had a negative effect on native and sport fish (like rainbow and brown trout) in the Blackfoot, because:

- They are fish-eaters and they begin to eat other fish soon after they hatch.
- They can eat fish that are 1/2 their body length and 1/3 their body weight.
- They mature (begin to spawn) when they are only 1 year old (while bull trout, for example, don't mature until they are 7 years old), so they reproduce rapidly.
- They lay 10 to 100 times as many eggs as trout.
- They spawn every year.
- They live for a long time—14-18 years.
- They behave differently than native predators that the fish have evolved with, so the prey species don't know how to avoid them.
- The only fish that eat them are other pike.
- Seasonally, bull trout and cutthroat trout are the most abundant food in the stomachs of northern pike.

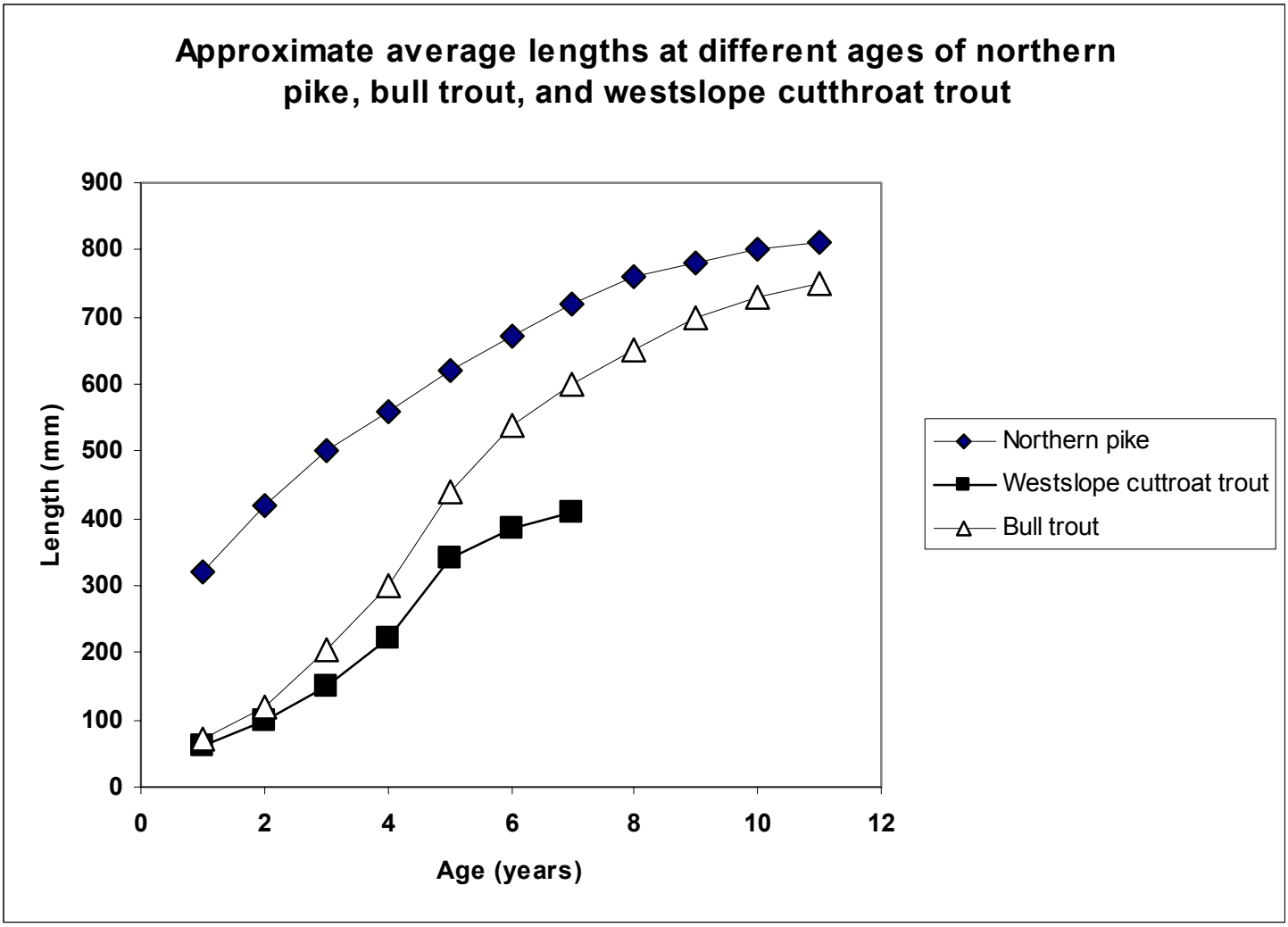
In conclusion, there are lots of them, living a long time and eating lots of native fish, while there's not much eating them!

What is Fish, Wildlife and Parks doing about it?

- Drawing down the Milltown reservoir to dry the sloughs where pike spawn and rear.
    - This strands and kills young of the year or age 1 pike that use these areas to *rear* (grow to maturity).
    - Incidentally, only illegally introduced, non-native fish use these areas of the reservoir (largemouth bass, yellow perch, and pumpkinseed), so native fish are not harmed.

- Catching adult pike and removing them during spawning (they are killed and most are given to "food banks" to feed hungry people).
- Capturing them, putting radio transmitters in them, and following them to see where they spawn, so they can be better managed and removed.
- Changing fishing regulations so there are no limits for pike.
- Education.

This chart shows the rapid growth rate that gives northern pike the ability to quickly outgrow and consume native trout



Conservation of native fish

Montana Department of Fish, Wildlife and Parks and other government agencies and private organizations are actively working for the conservation of Montana's fish. Some of the ways conservation is accomplished include:

Fishing Regulations

Fish, Wildlife and Parks regulates fishing to prevent over-harvest of fish by anglers. Fish populations are carefully monitored on an ongoing basis, and catch limits and other regulations designed to balance harvest with protection for each species in each area. You can check out current Montana fishing regulations at: fwp.state.mt.us/fieldguide.

Habitat Protection and Restoration

Stream beds and riparian habitat can be harmed by a variety of human activities, including poor timber harvest practices, overgrazing, road building, improper culvert installation, and withdrawing water from streams. Biologists and resource managers work to identify these problems, prevent damage before it occurs, and restore streams to more natural conditions when necessary. Restoration work may include:

- replacing culverts and irrigation headgates with "fish-friendly" types that allow fish passage;
- screening irrigation ditches to prevent fish from swimming down ditches;
- placing woody debris (logs and branches) into streams where it has been lost;
- replanting streamside vegetation; and
- implementing grazing practices that do not harm streams, which may include fencing streams and providing off-stream water sources for livestock.

Species Removal

Introduced, non-native fish species such as northern pike may be very detrimental to native fish, through predation, competition for food, hybridization, or for other, indirect reasons. At times, managers decide that these non-native species should be removed to allow native fish populations to recover. Removals are targeted at only some species, and may include encouraging anglers to catch more of these fish, through relaxed regulations and events such as fishing derbies, and catching fish through nets and shocking and removing them from the system, such as biologists are doing at Milltown Reservoir.

Education

Education about native fish may be the most important tool in conservation. The Adopt-A-Trout Program and others offered by Fish, Wildlife and Parks offer opportunities for everyone to learn more about fish ecology, human impacts, and management actions.

GLOSSARY

abiotic	The non-living components of a fish's habitat such as substrate, large woody debris, shade, and water quality.
adipose fin	The small, rayless fin along the midline of a fish's back behind the dorsal fin. Often times, this fin is removed as a marking technique.
alevin	A newly hatched fish which still has a yolk-sac.
amphidromous	Fish species which spawn in either fresh- or saltwater, make an initial migration as juveniles to the other environment for feeding and growth and return to the spawning area well before spawning to grow and mature.
anadromous	A life history strategy where young fish rear in freshwater, migrate to saltwater to grow and mature, and then return to freshwater to spawn as adults. The steelhead trout is an example of a species that uses this particular life history strategy.
anchor ice	Ice that forms on the bottom of a stream during winter. anchor ice is formed by the accumulation of frazil ice (ice formed in the stream water column). anchor ice does not allow fish to get between rocks on the bottom of the stream (substrate) and inhibits fish from feeding on invertebrates.
anchor tag	An alpha-numeric or color-coded, external tag injected near the dorsal fin of the fish. Because of its location, the tag is easy to identify by anglers and biologists.
anesthetic	A chemical such as MS-222 or clove oil used to reduce a fish's movement (similar to putting a human patient to sleep), often administered prior to a transmitter surgery.
aquatic	Describing the water environment including all associated organisms and abiotic components. These water environments include lakes, reservoirs, rivers, streams, springs, etc.
	to index
barrier	A barrier is a type of structure (physical, chemical, biological) that blocks the migration or spreading of aquatic organisms. Milltown Dam is an example of a physical structure that prevents the migrations of many of Montana's native species, including westslope cutthroat trout, bull trout, and largescale suckers. Natural barriers, such as waterfalls and streams that do not flow year-round, also block movements.
boulder	substrate particles greater than 25 cm in size.
burst rate	The amount of time between radio transmitter signals. The transmitters we use have a five second burst rate, so every five seconds they send out a signal.
	to index
catadromous	A life history strategy in which the adult form of a species of fish grows and matures in freshwater and returns to saltwater to spawn. Anguillid eels are catadromous.
caudal fin	The tail-fin on a fish.
cobble	substrate particles between 64 and 128 mm in size, good for spawning.
condensation	The process of water vapor being converted into a liquid form.

confluence	The point where two streams meet. For example, the mouth of the North Fork of the Blackfoot River is considered the confluence of the North Fork of the Blackfoot River and the mainstem Blackfoot River.
diadromy	A life history strategy in which a species spawns in a different environment than they grow and mature in. Anadromy and catadromy are examples of diadromy.
dorsal	Refers to the back of an organism or top of a fish.
dorsal fin	The anterior-most fin on a fish's back.
endangered species	A designation given to species in danger of extinction throughout its range. These species have been given high priority for protection under the federal endangered species Act. Examples of endangered species in Montana include the pallid and white Sturgeon, whooping crane, and black-footed ferret.
evaporation	The process of liquid water being transformed into a gas through a process called transpiration.
fin ray	The segmented structures in a fin that provide support.
frazil ice	Ice formed in the water column in very cold temperatures. frazil ice typically forms in shallow riffles where most of the heat in a stream is lost.
fry	A newly hatched, free swimming fish that has already absorbed its yolk sac.
fusiform	A streamlined body shape typical of most salmonines (trout, salmon and whitefish) which consists of a body which is taller than it is wide. This "torpedo" shape reduces resistance in the current allowing trout to hold position in a stream. An example of a fish with a non-fusiform body shape is the largescale sucker.
gill	A gill is an organ that allows fish to breathe underwater. Tiny blood vessels in the gill "lamellae" remove oxygen from the water while giving off carbon dioxide, similar to lungs in mammals. gill rakers are comblike projections on the leading edge of the gill, are used by some fish to filter food from the water. A fish's gill is very sensitive and should not be handled if possible.
glide	A shallow stream reach of uniform depth, with non-turbulent flow, flowing over similarly sized substrate.
gravel	substrate particles between 2 and 64 mm in size, good for spawning.
habitat	habitat refers to an area where a fish is found and provides the necessary requirements for the fish to live and grow including cover, food, and appropriate temperatures. habitat requirements are species specific and change throughout the species lifetime and seasons.
home range	The undefended area a particular species uses to gain resources, which varies by season and age.
homing	The ability of an adult fish to locate where it was born and migrate back to that stream to spawn. Fish have the ability to recognize the distinctive chemicals present in the stream in which they were born. These chemical cues are one way fish are guided back to that tributary for spawning.
hybrid	A hybrid is a combination of two different species. For example, when a cutthroat trout spawns with a rainbow trout, the resulting fry are hybrids sometimes called "cuttbows". Many hybrids cannot successfully reproduce, however those that can

	are detrimental because it leads to further hybridization with remaining native fish. hybridization is one of the reasons for decline of native fish, including westslope cutthroat trout that hybridize with introduced rainbow trout and bull trout that hybridize with introduced eastern brook trout.
lamellae	Small extensions on fish gills that increase the gill's surface area to improve oxygen consumption.
large woody debris	Material (such as a log, tree, or branches) with a diameter greater than 10 cm and a length greater than 1 meter in the stream. large woody debris is an important component of westslope cutthroat and bull trout habitat.
lateral line	The lateral line is a row of fine scales and pores located on the side of a fish. This is a primary sensory organ that is used by a fish to determine its position in the water column and enables a fish to maintain its equilibrium. It is also used by schooling fish to avoid collisions while swimming close together and to turn with the group.
life history	The pattern an organism follows to maximize growth, reproduction and fitness. Examples include: Resident: A fish that completes its whole life cycle in a small tributary stream. Fluvial: A fish that hatches in a small tributary, rears there for 1-4 years, and then migrates out to a larger river to mature. The fish then migrates back to the tributary to spawn. Adfluvial: A fish that is spawned in a small tributary, rears for a period of time in the tributary (1-4 years), and then migrates out to a lake where it matures. The fish then migrates back to the tributary to spawn.
macrophyte	A macrophyte is an aquatic (water) plant that grows along a stream or lake bottom, near the shoreline or floats near the surface.
mainstem	The largest stream in a particular drainage which accumulates a majority of water.
migration	To move from one area to another, commonly, but not always, for breeding.
mouth	The area where a stream or river enters another stream or river.
natal stream	The stream where a particular fish is born or reared. Many trout and salmon return to their natal stream to spawn, leaving their offspring to spend their juvenile years in the same stream, which is then imprinted as their natal stream.
native	Species that occur naturally in a drainage (not introduced by humans). Examples of some of Montana's native fish species include: westslope and yellowstone cutthroat trout, bull trout, arctic grayling, slimy sculpin, sauger, northern redbelly dace, northern pikeminnow, channel catfish, and longnose sucker. native fish are important in that they are adapted to local habitats, and their presence is an indication of high-quality habitat. native fish are a part of our heritage and are important culturally.
nutrient	An element (oxygen, nitrogen and phosphorus) or compound required for the growth and development of an organism.
olfaction	Chemical sensory, similar to smelling, used by fish for many purposes including capturing prey and navigation. Trout and salmon use olfaction as one way of finding their natal streams to spawn.
opercle	A bony "flap" behind a fish's head that protects the gills.

organism	A living thing consisting of one or more cells.
parr marks	Dark, vertical marks on many species of young trout that provide camouflage. These marks can remain on the fish through adulthood in some species such as the golden trout or small resident westslope cutthroat trout.
passive integrated transponder (pit) tags	A small (11mm), individually coded, electronic tag that is implanted into the body of a fish using a small syringe. This tag is activated by passing a hand-held scanner over the fish, and since it is off until it is activated, it can last for up to 50 years.
pectoral fin	First set of fins behind (anterior) a fish's head. On trout, these fins are located on the ventral side (underside) of the fish. Some fish, such as bass, have them behind their head along the mid-line of their body.
pelvic fin	Posterior-most paired fins on the ventral side of a fish's body.
piscivorous	piscivorous means "fish eating". Examples of piscivorous fish include northern pike or bull trout, but their diets also include aquatic insects.
pool	Stream feature that is normally deep and wide, slow water with no turbulence. Types of pools include: Scour- A rubbing or scraping motion by stream flow which causes cleaning or digging. Scour pool- A pool created by the scouring action of the stream flowing against an obstruction, such as a log or rock, causing an increase in depth. Plunge pool- A pool created by water passing over or through a complete or nearly complete channel obstruction, and dropping steeply into the streambed below scouring out a deeper spot in the stream.
potamodromous	A life history strategy in which a species of fish completes its entire life cycle in freshwater including growing, maturing and spawning. All species in Montana are potamodromous.
precipitation	Water in the form of rain, snow, sleet or hail that falls to the earth after accumulating in the atmosphere.
radio transmitter	A device implanted into or attached to an organism that emits a specific frequency detected and interpreted up by a telemetry receiver.
receiver	A device used in telemetry to detect specific frequencies emitted from a transmitter and to locate and decode the transmitter's signal.
redd	A redd is a depression created in the gravel where fish deposit their eggs (like a nest).
rheotaxis	The alignment of fish in the current (upstream/downstream) using their sensory organs such as the lateral line. Stream fishes, such as the cutthroat trout typically face upstream for feeding purposes.
riffle	Shallow stream reaches that flow over rough bed material (like cobble), causing small ripples or waves (turbulence).
riparian area (zone)	The area and vegetation adjacent to streams and rivers.
spawn	The way in which most fish reproduce. The female lays the eggs and the male fertilizes the eggs with milt.
species of special concern	A classification applied to many native fish (recognized by the State of Montana) whose populations have declined in number and size. These fish are not

	threatened or endangered, but may require special management. Examples of species of special concern in Montana include paddlefish, westslope and Yellowstone cutthroat trout, arctic grayling and the blue sucker.
staging	The time period in which a fish stays at the mouth of a tributary stream (to meet its mate) in which it plans to spawn.
substrate	Mineral (rock) or organic (plant) material at the bottom of a stream. The order of the following substrate types is from the smallest particles in the stream, to the largest particles.Sand: substrate particle between 0.062 and 2 mm in size. gravel: substrate particles between 2 and 64 mm in size, good for spawning. cobble: substrate particles between 64 and 128 mm in size, good for spawning. boulder: substrate particles greater than 25 cm in size.
telemetry	A method used to track animal movements that relies upon the detection of radio signals at specific frequencies.
threatened species	A designation given to those species that are in danger of becoming endangered in the near future. An example of a threatened species in Montana is the bull trout.
triangulation	A method in telemetry studies used to pinpoint where the exact location of an animal is by relying on the intensity of signals at three different points that form a triangle. The middle point receives the strongest signal.
tributary	A stream that flows into or joins a larger stream (for example, Monture Creek is a tributary to the Blackfoot River).
turbidity	The relative clarity of water. An unclear (poor visibility) stream is usually caused by sediment flowing downstream such as spring runoff.
turbulent	Streamflows, which causes disturbance of the water surface and produces waves. A riffle is usually turbulent.
velocity	Rate at which water travels downstream in a river or stream and is usually measured in centimeters per second (cm/s).
ventral	Refers to the underside of an organism
vermiculations	"Worm-like" markings on the skin of certain trout, such as brook trout. These marking are useful for identifying brook trout from bull trout. Brook trout also have black markings on their dorsal fin and bull trout do not.
visible implant (vi) tags	Very small (1-2 mm), individually coded alpha-numeric (example: J71) tags implanted into any clear tissue (commonly inserted behind the eye in trout).
visible implant elastomer (vie) tags	Externally visible, internally implanted fluorescent plastic tag that is inserted into clear tissues using a small needle. The tag remains in liquid form until it solidifies after injection, but remains pliable. VIE tags are often used to distinguish groups of fish.
water column	The portion of a body of water between its surface and its bottom (substrate) commonly used to describe a fish's location.
water quality	The physical, chemical and biological components of a lake, reservoir, or stream, and the level of degradation to each of these components.
watershed	The entire area where water is collected from for each individual stream, river and spring, which includes both surface and sub-surface flow. The Blackfoot River

	and all of its tributaries is an example of a watershed.
yagi	A hand held antenna that consists of several (usually three) parallel elements attached to a perpendicular support. A yagi antenna is a directional antenna, meaning signal strength is increased when the antenna is pointed in the direction of the transmitter, allowing the tracker to determine specific locations of the transmitter.

LESSONS

Trout Identification

Level: 2nd-5th Grade

Subjects: Science, Art, Social Studies, and Language Arts/Vocabulary

Objectives: **Students will….**

Research trout characteristics and use their findings to differentiate between trout species.

Sketch the different trout species using specific details to distinguish each species.

Create a paper mache model in small cooperative groups.

Identify and label parts of a fish.

Assessment:

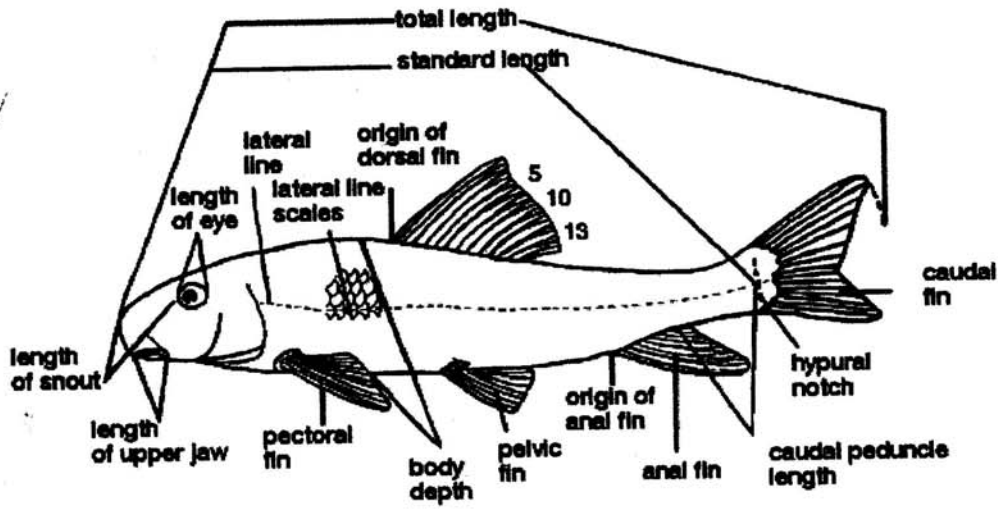
Paper mache models will be used to assess understanding of specific trout characteristics.

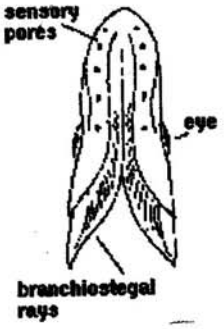
Assessment of fish anatomy can either be pencil and paper or a wet lab with actual fish.

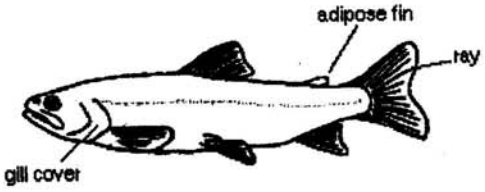
Background Information:

Students may use attached information sheets, ***Fish of Montana*** CD, Adopt-A-Trout Web site and/or any other resources

FISH ANATOMY







Identifying parts of the Trout

eye

nostril

mouth

gill cover

pectoral fin

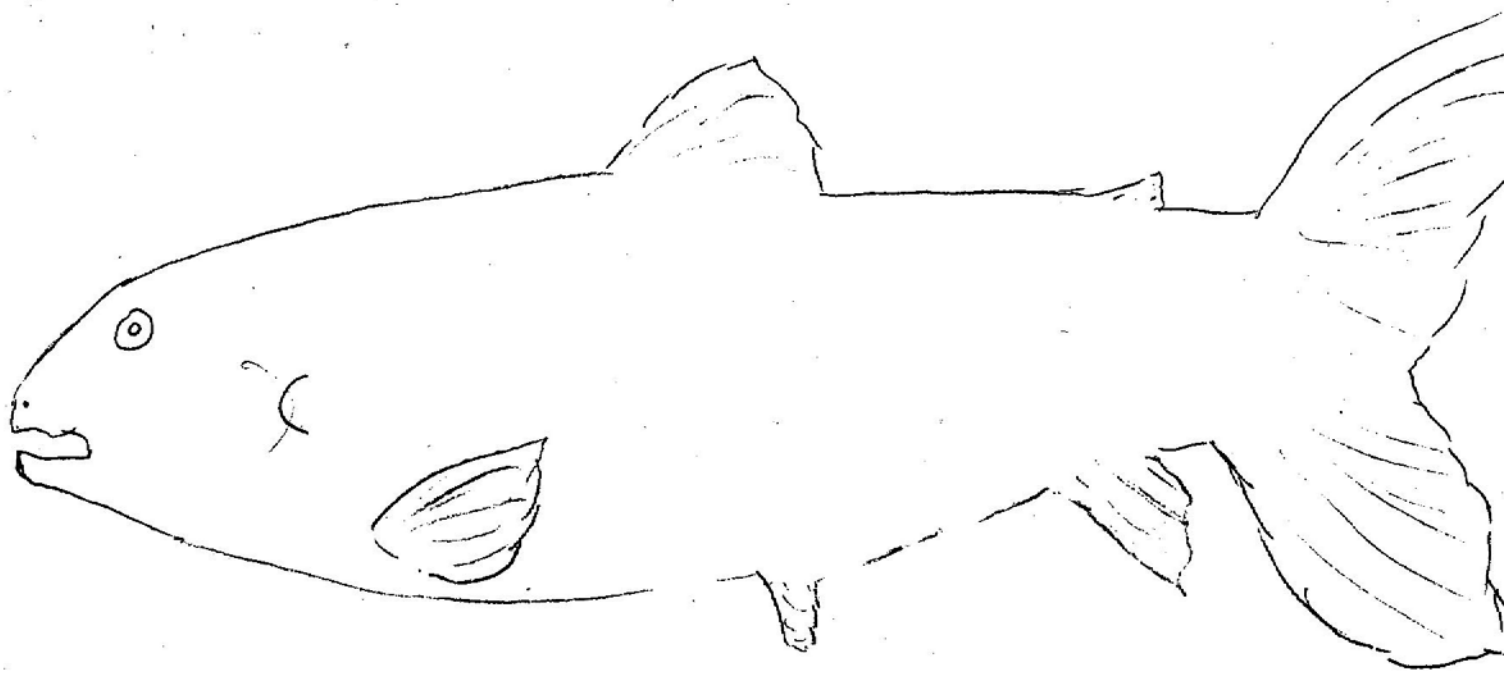
pelvic fin

anal fin

caudal fin

adipose fin

dorsal fin



Fish Identification Cards

Print fish illustrations from the FWP Fish of Montana CD-ROM. To do this, just find the species you want on the CD and click *print*. You can laminate the pages and use them for different activities. Some ideas are:

1. Use the cards to practice fish identification with students. Once they have studied them well, play Around the World with them. As you hold up the fish, students must name them. If you want to challenge them more, teach them the Latin names also.

2. Make two categories: Blackfoot Natives and Non-natives. Students are given the cards and they have to sort them into the correct categories as fast as possible. Time them and reward the fastest student.

3. Display them on an Adopt-A-Trout bulletin board. Students can look at them daily and learn to identify them.

4. If you have a map of the Blackfoot Watershed including Milltown Dam, students can place the fish on the map in their habitats. For example, pike would primarily go in Milltown Reservoir and other lakes. Students would have to be familiar with good fish habitats and their locations.

LIFECYCLES
Typical Trout Lifecycle

Level: 2nd-5th Grade

Subjects: Science, Art, and Language Arts/Vocabulary

Objectives: **Students will….**

Identify and define the 6 stages of a typical trout lifecycle.

Create a life-size model/mobile to illustrate these stages.

Explain the lifecycle using correct vocabulary to describe the stages.

Background Information:

Stage I: Eyed-Egg (partially developed egg which shows the embryo's eye)

Stage II: Alevin (newly hatched fish which still has yolk-sac)

Stage III: Fry (young fish that is free swimming, no longer has yolk-sac (absorbed), and has left redd in search of food)

Stage IV: Fingerling (juvenile trout—about 3.5 inches in length)

Stage V: Mature Adult

Stage VI: Spawning Adult (sexually mature adult that is laying or fertilizing eggs)

Assessment:

Students' models/mobiles will be used as a form of assessing student understanding. Vocabulary will be assessed through attached spelling packets and small group presentations.

Extensions/Resources:

Fish and Game Trout Trunk (wax trout models, preserved life-cycle models, and brochures).

Adopt-A-Trout Web site

A TYPICAL TROUT LIFE CYCLE

Hello, my name is Tommy, I am a Rainbow Trout. At this point I am still an eyed egg. An eyed egg is an egg that has a partially developed eye. So I guess I will be hanging around for a while, in fact, you could say that I will be your storyteller for the day!

Now, Iam an alevin and I am free from the egg, but I am still sensitive to light. I can die if I swim too faraway from the redd. A redd is a nest where eggs and small fish like me live. I have a yolk sac on the bottom of my tummy that provides me with food.

I am now a fry. My yolk sac is gone and I am old enough to seek food. I am also old enough to leave the redd and go just a little distance from it. Now I am not stuck all the time in the redd with all my brothers and sisters. I am free!!

Hi! Here I am, now a fingerling. It's been a while since I had a yolk sac and I am having no trouble finding food. I am even old enough to swim far away from the redd.

I am now an adult fish and I can swim far away from the redd. Well, I have to go now and start looking for a mate so that I can spawn.

I am now in the spawning stage, I have found my mate and I will soon have beautiful children!

Typical Trout Lifecycle

_____

Name

Stage I: Eyed-Egg (partially developed egg which shows the embryo's eye)

Stage II: Alevin (newly hatched fish which still has yolk-sac)

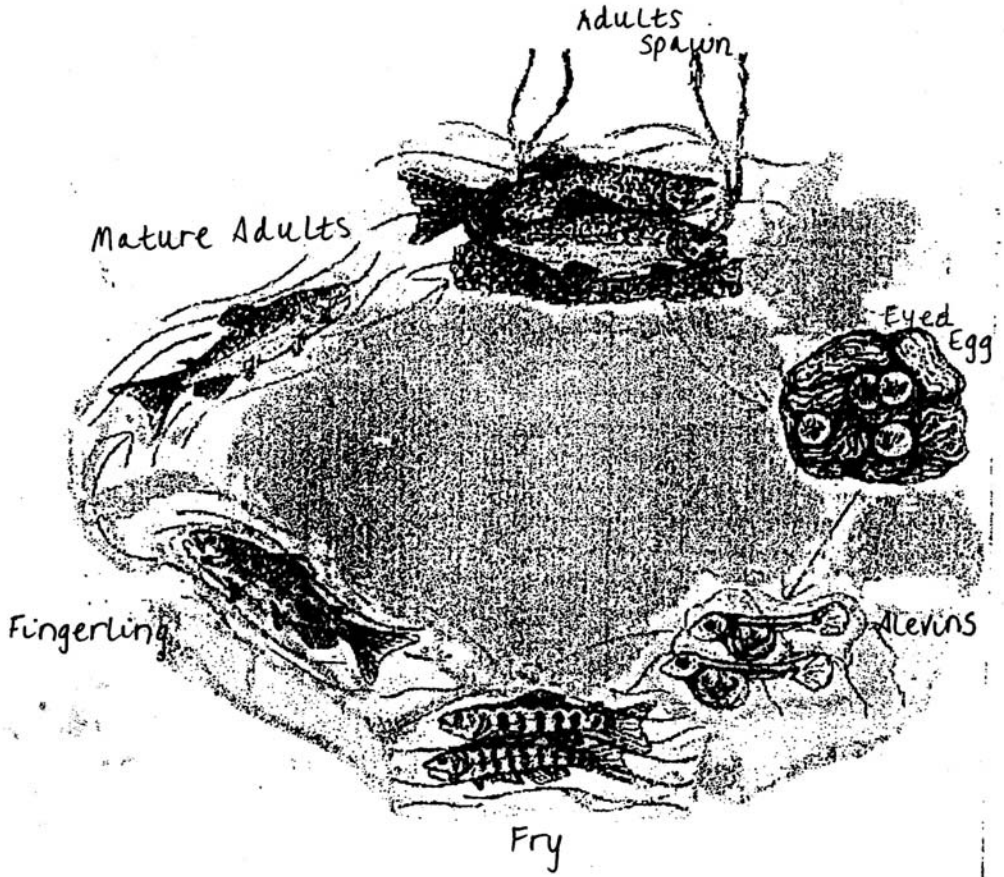
Stage III: Fry (young fish that is free swimming, no longer has yolk-sac (absorbed), and has left redd in search of food)

Stage IV: Fingerling (juvenile trout—about 3.5 inches in length)

Stage V: Mature Adult

Stage VI: Spawning Adult (sexually mature adult that is laying or fertilizing eggs)

A Typical Trout Life Cycle



Spelling Packet
Trout Life-Cycle

_____
Name

1. alevin

2. fingerling

3. eyed egg

4. spawning

5. migration

6. yolk-sac

7. fry

8. adult

9. mature

10. redd

11. hatched

12. embryo

Bonus Words:

fertilization
riparian zone

ABC Order

Please put the following spelling words in alphabetical order (16).

alevin fry fingerling adult eyed egg mature redd spawning migration hatched yolk-sac embryo fertilization riparian zone

1. **9.**

2. **10.**

3. **11.**

4. **12.**

5. **13.**

6. **14.**

7. **15.**

8. **16.**

3 X

Please write each spelling word three times.

1. **alevin** _____ _____ _____
2. **fry** _____ _____ _____
3. **fingerling** _____ _____ _____
4. **adult** _____ _____ _____
5. **eyed egg** _____ _____

   _____
6. **mature** _____ _____ _____
7. **redd** _____ _____ _____
8. **spawning** _____ _____ _____
9. **migration**_____ _____ _____
10. **hatched** _____ _____ _____
11. **yolk-sac**_____ _____ _____
12. **embryo**_____ _____ _____
13. **fertilization**_____ _____

    _____
14. **riparian zone** _____ _____

    _____

UNSCRAMBLE

Please unscramble the following words and write each spelling word correctly on the line provided.

alevin fry fingerling adult eyed egg mature redd spawning migration hatched yolk-sac embryo fertilization riparian zone

1. ryf _____
2. dred _____
3. duatl _____
4. ratoniimg_____
5. inleav _____
6. auemtr _____
7. finegginlr _____
8. pawnsing _____
9. yeed geg _____ _____
10. headthc _____
11. –kolycas_____
12. realizfittino _____
13. bremoy _____
14. rainpair ozen _____ _____

DIAGRAM

Using as many of the following words as possible, please sketch and label the two diagrams below.

alevin fry fingerling adult ~~eyed~~ ~~egg~~ mature redd spawning migration hatched yolk-sac embryo fertilization riparian zone

Typical Trout Lifecycle

⊙⊙⊙eyed eggs ►

⊙⊙⊙

Trout spawning in small stream

Short Story

Please create a short story below using as many of your spelling words as possible. It can be fiction (not true) or non-fiction (true). Be creative! Please use proper punctuation, complete sentences, correct spelling, and great ideas!

NAME:_____ DATE:_____

TROUT LIFE CYCLE QUIZ

1. Order the following life cycle stages of a fresh-water trout species. The first stage = 1, the final stage = 6.

_____alevin _____spawning

_____fry _____adult

_____egg _____fingerling

Multiple choice. Circle the best answer to each question.

2. Which of the following trout species spends part of its life in the ocean?
a.) brook trout b.) steelhead c.) brown trout d.) goldfish

3. The large fin located on the back of a trout is know as
a.) large dorsal fin b.) caudal fin c.) pectoral fin d.) huckleberry fin

4. The tail fin of a trout is known as:
a.) anal fin (b)caudal fin (c) adipose fin (d)lateral fin

5. The most unique feature found on an alevin is its:
(a)large dorsal fin (b)rainbow colors (c)yolk sac (d)eye

6. The gravel bed which female trout lay their eggs is known as a:
(a) clearing (b) snag (c) redd (d) salmonid

7. The measure of the acidity or alkalinity of water or other solution is known as a _____ test.
(a) spelling (b) rx (c) pH (d) ammonia

8. A member of the salmon or trout family is known as an:
(a) alevin (b)troutoid (c) rainbow (d)salmonid

9. After fry, the next stage of development is:
(a) fingerling (b) pan fish (c) spawn (d) trout

10. The first stage in the development of a trout is:
(a) yolked egg (b) adult stage (c) fish egg (d)eyed egg

Name:_____ Date:_____

TROUT LIFE CYCLE QUIZ

Circle the best answer to the following:

1. The first stage in the development of a trout is:
a. yolked egg b. alevin c. fish egg d. eyed egg

2. The second stage of trout development is:
a. alevin b. fingerling c. pan fish d. redd

3. A trout is recognized as a fry when:
a. It swims from the nest b. its yolk sack is gone c. its eyes turn black d. it can swim and feed on its own

4. After fry, the next stage of development is:
a. fingerling b. pan fish c. spawn d. trout

5. The "Redd" is :
a. the skin left by the yolk sac b. the nesting area of the fish
c. a disease that kills fish d. the tender area around the gills

6. After the fingerling stage comes the:
a. chum stage b. free water stage c. spawn stage
d. adult stage

7. The best pH for trout is:
a. 5.0pH b. 7.0pH c. 8.0 pH d. 6.0 pH

Name _____

Date _____

Draw, label and color the life cycle of a trout.

HABITAT

Level: 2nd- 5th Grade

Subjects: Science, Language Arts/Vocabulary and Art

Objectives: **Students will…**

- Read background on cutthroat and Bull Trout from ***Montana's Trout*** to become familiar with and gain an understanding of the word, ***habitat.***
- Explain habitat and the vocabulary words associated with it.
- Create models of good and bad habitat for trout (include an example of a redd).
- Name a minimum of 5 examples of good habitat.
- Explain and understand the meaning of substrate, turbidity, riparian area, spawning, vegetation, riffle, turbulent, and water depth.
- Visit a river and stream and discover the habitat needed for trout.

Background Information:

- **Habitat:** ***Habitat*** refers to an area where a fish is found and provides the necessary requirements for the fish to live and grow including cover, food, and appropriate temperatures. ***Habitat*** requirements are species-specific and change throughout the species' lifetime and the seasons.
- **Substrate:** Mineral (rock) or organic (plant) material at the bottom of a stream. **The order of the following substrate types is from the smallest particles in the stream, to the largest particles.** **Sand:** ***substrate*** *particle between 0.062 and 2 mm in size.*
  Gravel: ***substrate*** *particles between 2 and 64 mm in size, good for spawning.*
  Cobble: ***substrate*** *particles between 64 and 128mm in size, good for spawning.*
  Boulder: ***substrate*** *particles greater than 25 cm in size.*
- **Turbidity:** The relative clarity of water. An unclear (poor visibility) stream is usually caused by sediment flowing downstream such as spring runoff.
- **Vegetation:** Plants in or overhanging the stream, Submerged logs, ***large woody debris*** (material such as a log, tree, or branches with a diameter greater than 10 cm and a length greater than 1 meter) in the stream. ***Large woody debris*** is an important component of westslope cutthroat and bull trout ***habitat.***
- **Spawning:** The way in which most fish reproduce. The female lays the eggs and the male fertilizes the eggs with milt.
- **Water depth:**

Pool: stream feature that is normally deep and wide, slow water with no turbulence. **Types of pools are:**

Scour pool—a pool created by the scouring action of the stream flowing against an obstruction, such as a log or rock, causing an increase in depth.

Plunge pool—a pool created by water passing over or through a complete or nearly complete channel obstruction, and dropping steeply into the streambed below scouring out a deeper spot in the stream.

- **Riparian Area (zone):** The area and vegetation adjacent to streams and rivers.
- **Riffle:** Shallow stream reaches that flow over rough bed material (like ***cobble***), causing small ripples or waves (***turbulence***).
- **Turbulent:** Describes a disturbance of the water surface. A **riffle** is usually **turbulent.**

Assessment:

- Students will build a model of a trout's habitat. Students will be divided into groups and will build a good habitat example and examples of poor habitat Students may use materials such as clay, branches, rocks, grass, etc. Students will display their models and give a verbal description of the habitat they built. Students will be assessed on their ability to discuss what they made and why it is a good or poor example.

  *A paper/pencil worksheet will be completed after the habitats are constructed.

  * Students will write a descriptive paragraph using trout and habitat vocabulary words. They will include information on what their habitat contained and diet for the trout. The students will be instructed to draw and color a picture of their habitat.

- Students will construct a habitat using liter bottles and a guppy. Students will watch the life cycle and record the results daily.

Extensions/Resources:

Fish and Game Trout Trunk
Dept. of FWP (take a field trip to see trout habitat)

Name _____ Date _____

HABITAT

Use the model of the fish habitat to answer the following:

5. **Name at least 5 good examples you see of "good habitat".**

6. **What do you see that may be harmful to the life of the trout? (list each example you see)**

7. **Is there an example of a redd?**

8. **What would you have done differently to provide the best habitat possible for your trout?**

TROUT FACTS

Name of your trout: _____

Description of your trout: (color—be descriptive, size, approximate weight):

HABITAT:

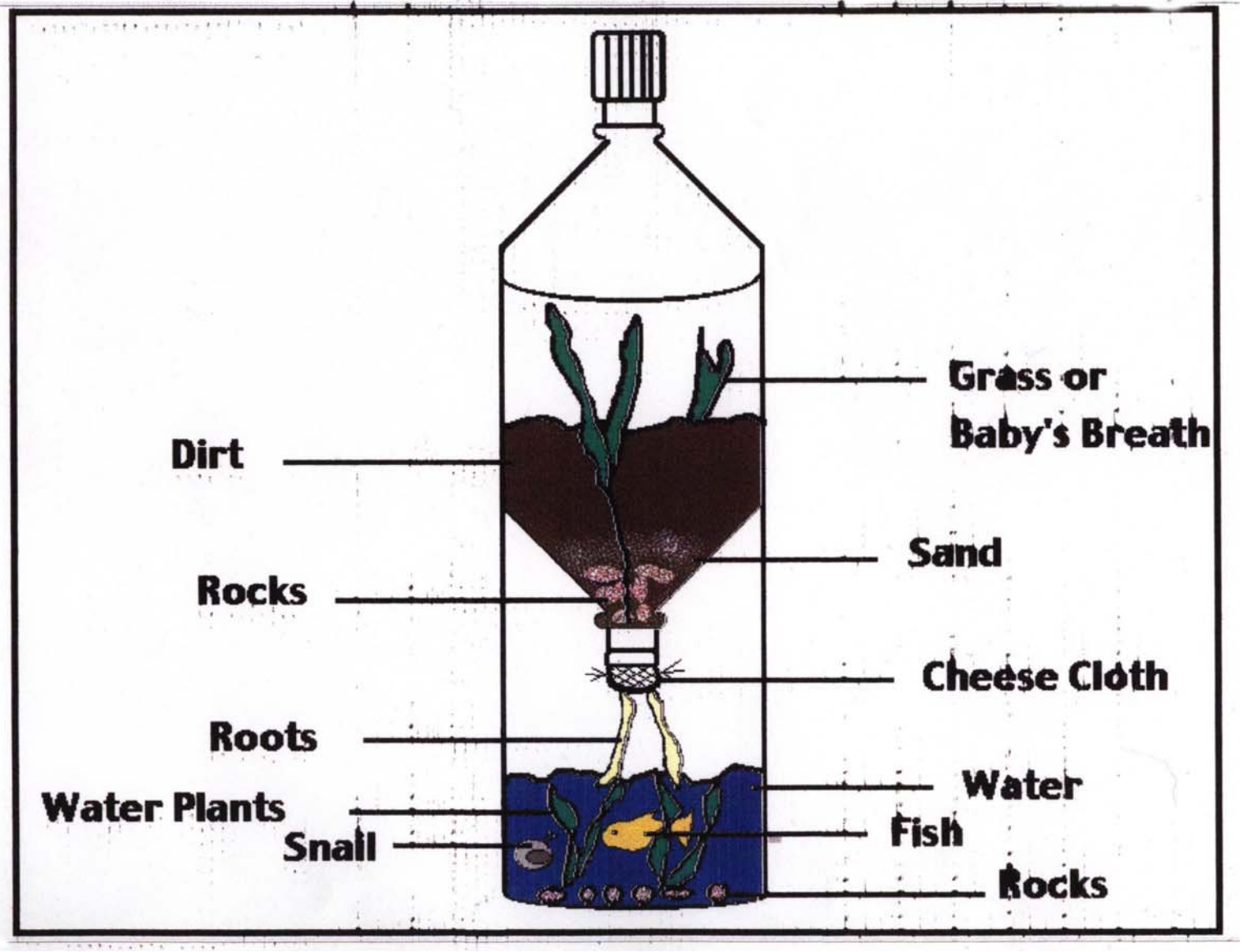
DIET:

OTHER INTERESTING FACTS:

Habitat Directions

Materials	• 2 liter soft drink bottles • Small rocks • Gravel • Dirt • Guppy • Water Plants • Grass seed • Sand • Cheese cloth • Water • Snail (optional)
Directions	• Cut the two bottles in half. • Discard one bottle bottom. • Layer one bottom with rocks. • Fill that bottle one-half full of water. • Add water plants, guppy and snail to water. • Tie cheese cloth around the lip of one bottle top. • Invert that bottle into the bottom half of the water-filled bottom.. • Layer this portion of the bottle with rocks. • Add about a half inch of sand. • Add about 2 inches of dirt. • Plant the grass seeds and water. • Put the other bottle top on top of the inverted bottle top. • Tape the three bottle halves together with clear tape. • Set the bottles near a window and watch the life cycle. • Record results daily. See chart.

Habitat Diagram



TROUT VOCABULARY

"Fish Wall"

(Word Wall of Fish Terms)

Level: 2nd-5th Grade

Subjects: Science and Language Arts/Vocabulary

Objectives: **Students will….**

Research and define terms/vocabulary relevant to Adopt-A-Trout Program.

Post information in classroom and use in writing activities.

TIME: Ongoing project, to be updated and reviewed weekly during school year.

Procedure:

1. On Monday each week, students will each draw a new vocabulary word from a "Fish Bowl".

2. Each student will be responsible for defining, illustrating, and sharing their word. Students will write and define their word on the attached "Fish" strips.

3. Students may use Adopt-A-Trout Glossary on Web site, printed version in this curriculum, or any other relevant resource.

*Begin with most basic words to build foundation-suggestions below. Also try to group words on wall that are connected (i.e. lifecycle terms, anatomy, etc.):

eyed egg	alevin	fry	fingerling
spawning	redd	yolk-sac	habitat
adipose fin	caudal fin	dorsal fin	aquatic
pectoral fin	barrier	confluence	ray
gill	gravel	lateral line	migration
mouth	native	pool	native
riffle	riparian zone	telemetry	tributary
watershed	radio transmitter		

ADOPT-A-TROUT VOCABULARY
POWER POINT LESSON

NOTE: Instructor must be able to use Microsoft Power Point to teach this lesson. Make sure that students are all using the same version of Windows throughout the entire project. Also make sure that the computer on which the students show the Power Point has that same version of Windows. Students will encounter problems jumping between Windows programs, especially if one of the programs is Windows XP.

Grade Level: 4-6

Objective: Students will be able to navigate the Adopt-A-Trout website www.fwp.state.mt.us/adoptatrout/ and become more familiar with the Adopt-A-Trout vocabulary. They will also learn the basics of the Microsoft Power Point program.

Part 1: Take students to the Adopt-A-Trout website. Introduce them to the site and ask them to hunt for the link to the Glossary. Go to the Glossary and quickly scroll through the words. Assign each student a word and teach them how to properly pronounce the word. Explain to the students that they will be creating a three slide Power Point Presentation on their assigned word (See attached assignment sheet and rubric).

Part 2: Take students to the computer lab or use a projector to display the Power Point lesson to the class. You will need to break this into three 30 minute lessons.

> **Lesson One- Objective 1**- Students will be able to open a new project, choose a new slide, choose a background, and add text.
>
> The instructor must do a 10 minute power lesson showing the student how to carry out the four tasks in Objective 1. Once you have taught those tasks give the students 20 minutes to explore and play with the program. They will practice the newly learned tasks, as well as teach themselves new things about the program.
>
> **Lesson Two-Objective 2**- Students will be able to manipulate the text using *word art* and other font tools. They will also be able to cut and paste documents and photos into their slides. They will also be able to insert *clip art*. Go to google.com and click on image search to find lots of good photos of fish etc…
>
> The instructor must do a 10 minute power lesson covering the objectives listed in Objective 2. Many of them will have already taught themselves how to use those tools when they explored in lesson one. Following the lesson, give them another 20 minute exploration and play session with the program. Do not let them start on their assigned project yet.

Lesson Three-Objective 3- Students will be able to insert sound into their slideshow. They will be able to retrieve sound from the Power Point Gallery or from the Internet. Teach them that sound does not always transfer well into the program.

The instructor must do a 10 minute power lesson on inserting sound into the program. Again follow this with 20 minutes play time with the program. You will be impressed with what the kids can figure out on their own. They will ask lots of individual questions along the way so be prepared to roam the room a lot.

Students are now ready to begin the assigned Power Point vocabulary project. Pass out the attached sheet to each student and re-explain the assignment. Go over the rubric as a class. Show some sample Power Point projects and point out the strengths and weaknesses. Require that the students hand the instructor the rubric before they present their slideshow to the class. The instructor will be able to grade the presentations as the student presents, using these sheets. The following resources will be helpful for students' research:

Adopt a trout website Links
Fish of Montana CD-Rom from Montana Fish Wildlife and Parks
www.google images
British Columbia fish site from AAT link

Name_____

Adopt-A-Trout Power Point Assignment and Rubric

You will be creating a Power Point Slide Show that defines and gives details about your assigned vocabulary word from the Adopt-A-Trout website glossary. Your assigned vocabulary word is_____.
Your slide show must be a minimum of three slides long. If you want to add more information to your show you may add more slides as long as you meet the specific requirements for the first three slides. See rubric below.

Rubric

Slide Requirements	Points Possible	Points Earned
Slide One		
Background	1	
Title	2	
Student's name	2	
Slide Two		
Background	1	
Word and definition	2	
Animated clipart	2	
Slide Three		
Background	1	
Three important details or facts relating to the vocabulary word	2	
One sound and image	2	
Overall project accuracy, quality, and design	10	
Total Points Possible:		Total Points Earned:

Comments: Final Grade=_____

Adopt-A-Trout Teacher's Guide

Tracking Fish Movements via the Website
and
Using data Collected by Biologists

Whether your class has "officially" adopted a fish in the program or you are just interested in following fish by logging onto the AAT website on your own, you will want to make the most of this exciting opportunity to share in the collection of data by scientists working in the field! Following are some activities designed to help you use the information available to you by participating in Adopt-A-Trout.

1. Data collection

What kinds of information did biologists record about your fish? Have your students list all the ***variables*** (types of information that might be different for different fish) listed in the Capture and Transmitter Implanting section of the website, and why they think it might be important to record this information for each.

2. Tracking fish

At least once per week, check on your fish and discuss in class or have your students answer the following questions:

1. Did your fish move this week?
2. If so, did it travel upstream or downstream?
3. Approximately how far did it move in a week?
4. Is the fish in the river, a ***tributary*** (a stream that flows into a larger stream, such as the river), or the reservoir? (These terms are covered in the Glossary of fish terms on the website).
5. Do you see any pattern to its movements? For example, does it move every day, every other day, or just when the moon is full?
6. Do you think it has reached its spawning location yet?
7. Where do you think it is headed? Why?

3. Answering research questions

Have your students use the AAT website (fwp.state.mt.us/adoptatrout) or the printed pages that follow this lesson to answer the questions provided. They will

be using actual data that were collected by fisheries biologists as part of their research on fish in the Blackfoot and Clark Fork watersheds.

Before you give out the student worksheets, first ask your students to look at the data tables and explain to them that these data (singular is *datum*) are the information that biologists have collected by capturing fish, measuring them, implanting transmitters in them, and following their movements. Biologists, like all scientists, ask ***questions*** that they think are interesting and important, and would like to know the answers to. Then they figure out ways to answer those questions by ***making observations*** of some kind—gathering information by watching animals and recording what they do, measuring animals or plants, or recording information about their habitats, food, or other important matters. This is called ***data collection***, just another term for gathering and recording information. The next step is to ***analyze the data***—that is, figure out what the information means. Often ***statistics***, or mathematical calculations, are used in data analyses, but these can be as simple as calculating averages and making graphs of relationships. New questions usually arise as the original ones are answered and scientists ***reflect*** on what they've found. Finally, but not the least important, is explaining what they've learned to other people, including other scientists, resource managers, educators, and the public who are interested in and may support their work with their tax dollars.

For this exercise, have your students look carefully at the information collected during the AAT research (which they have listed in #1 above).
Discuss the following questions:

- What kinds of data did biologists record?
- How might they have gotten some of the information? (If your students have been on an AAT field trip, they can describe much of this firsthand. If not, see if they can figure out how it might be done).

Now, ask your students to come up with some questions that they would like to know the answers to about the fish in the Blackfoot. Give them a few minutes to brainstorm in small groups and have each group list a few questions. Then make a "master list" on the board of all the questions. There may be many questions that can't actually be answered using the information available in AAT; don't worry about this immediately. It's important for your students to just start thinking about all the questions they are interested in and explore this creative step in the scientific process.

After you have a list, ask them to look at the questions they've come up with and decide which ones they really can answer using the information in the tables. Have them describe the process they'll use--how they will analyze the data to come up with answers.

At this point, you may want to share this list of questions that fisheries biologists try to answer when they collect information through this and other research projects:

- How big are the fish? Are males and females of the same species about the same size?
- How far do fish travel to spawn?
- How long does it take them to get there?
- Which species travel farther?
- Do bigger fish travel farther than smaller fish?
- Do males and females travel similar distances?
- Are there certain places that seem to be especially important for spawning? Do they all go to the same places?
- What was the reason fish migrated (spawning or otherwise)?
- How many fish returned downstream of dam after spawning? What does this mean for them?
- How many died after spawning- did some species die more than others? Did one sex die more than the other did?
- How many were harvested by anglers, and how many legally?

Your students may be surprised to find out that they have come up with some of the same questions that biologists ask!

You can proceed to the next lesson, which is to have students answer questions using the data provided. If they came up with appropriate questions on their own, you can go ahead and let them answer those, or you can use the student worksheets that follow to guide their analyses.
Students can use the tables on the website or you can copy the BLACKFOOT FISHERIES RESEARCH DATA pages (following the worksheets) for them to use. Students will use math skills to perform summary statistics, make comparisons, and create and read graphs.

Adopt-A-Trout
Blackfoot Fisheries Research Questions

Use the data on the AAT website (or on the sheets your teacher gives you) to answer the following questions:

WESTSLOPE CUTTHROAT TROUT AND BULL TROUT

1. What is the **average length** of westslope cutthroat trout captured?
_____ mm
How does this compare to the average size that westslope cutthroat trout usually reach? (Hint: Look for information in a field guide or at the Montana Fish, Wildlife and Parks online field guide at fwp.state.mt.us/fieldguide).

_____

2. What is the **average length** of bull trout captured?
_____ mm
How does this compare to the average size that bull trout usually reach?

_____

3. Is there a **correlation** between the length and weight of fish—that is, do longer fish weigh more than shorter fish? _____ If so, can you **predict** the approximate weight of a cutthroat trout in the Blackfoot that is 400 mm long? _____ gm

4. On average, fish of which species **traveled farther** to spawn, cutthroat trout (average = _____ km) or bull trout (average = _____ km)? _____

5. Does there seem to be any **relationship** between size (length) of fish and the distance they traveled to spawn? For example, do bigger fish generally go farther than smaller fish of the same species? Using the cutthroat trout data, make a graph that shows the size of each

fish on the X axis and the distance traveled on the Y axis. Your teacher will help you with this if you don't know how to construct such a graph. Explain your answer.

_____

_____

If so, are there ***exceptions*** to this?

_____

6. Do fish that migrate up the Blackfoot River travel as far, ***on average***, as fish that migrate up the Clark Fork River? Explain your answer:

_____

_____

7. Would you expect biologists to capture more males than females, more females, or about the same number of males and females? Why?

_____

Is this what happened? _____
What **percentage** of fish captured are males? _____
What percentage are females? _____

8. Is there a difference in the average size of males and females of the same species? _____
Average length of female westslope cutthroat trout:
_____mm
Average length of male westslope cutthroat trout:
_____mm
Average length of female bull trout: _____mm
Average length of male bull trout: _____mm

9. What is the approximate ***rate of travel*** for bull trout traveling upstream to spawn? _____ km/day

10. Do fish take as long to return downstream after spawning as they do to travel upstream to their spawning sites?

_____

11. How many different streams do bull trout use for spawning in the Blackfoot?

_____

Is this important to bull trout **conservation**? Why or why not?

_____

_____

LARGESCALE SUCKERS

12. What is the **average length** of <u>largescale suckers</u> captured?

_____ mm

13. How far on average did largescale suckers migrate?

_____km

How does this compare to distances traveled by the trout?

_____

14. Do suckers seem to use the same areas for spawning that trout use? Explain your answer.

_____

_____

NORTHERN PIKE

15. What is the **average length** of northern pike captured?

_____ mm

How does this compare to the average size that northern pike usually reach?

16. How far on average did northern pike travel to spawn?

_____km

How does this compare to the distances traveled by trout and suckers?

_____

ALL FISH

17. If you have adopted a fish to track, how does your fish compare to the other fish of the same species? Is it longer or shorter than average? _____ Has it traveled as far as the average distance traveled by other fish of that species?

_____

18. How many fish returned downstream of the dam after spawning?

_____

What does this mean to them?

_____

_____

_____

_____

19. How many fish died after spawning? _____

Did some species die more than others?

_____

How many were harvested by anglers, and how many of these were harvested legally?

_____

BLACKFOOT FISHERIES RESEARCH DATA

Table 1. Descriptions of length (mm), weight (kg), date captured, major drainage ascended, farthest upstream or spawning location, and distance (km) of that location from Milltown Dam for radio-tagged westslope cutthroat trout (WCT) and bull trout (BT) 2000. Fish numbers correspond to numbers in Figure 1.

Number	Species	Length	Weight	Date captured	Drainage ascended	Spawning location or upriver-most location	Distance migrated	Final location or fate
1	WCT	357		April 19	Clark Fork[b]	Donovan Creek	13.9	Mortality[c]
2	WCT	340		April 23	Blackfoot	Blackfoot River	44.3	Mortality[d]
3	WCT	372		April 23	Blackfoot	Clearwater River	86.9	Mortality[c]
4	WCT	395		April 10	Clark Fork	Deer Creek	4.2	Mortality[ef]
5[a]	WCT	370		March 27				
6	WCT	385		April 10	Blackfoot[b]	Gold Creek	31.4	
7[a]	WCT	405		April 5				
8	WCT	360		April 19	Blackfoot	Monture Creek	105.1	Mortality[c]
9	WCT	357		April 19	Blackfoot	Monture Creek	105.1	Blackfoot River
10	WCT	365		April 19	Blackfoot	Monture Creek	89.2	Monture Creek

11	WCT	380		April 10	Blackfoot[b]	Dry Creek	113.9	Blackfoot River [f]
B1	BT	725	4.1	June 28	Blackfoot	Monture Creek	79.9	Monture Creek [e]
B2	BT	735	4.1	June 29	Blackfoot	North Fork	127.2	North Fork
B3	BT	642	2.6	July 3	Blackfoot	North Fork	101.1	Below dam
B4	BT	810	5.1	July 3	Blackfoot	North Fork	118.2	Below dam[e]
B5	BT	505	1.0	July 3	Blackfoot	Monture Creek	80.0	Blackfoot River
B6	BT	675	3.3	July 4	Blackfoot	Monture Creek	92.4	Below dam
B7	BT	550	2.0	July 4	Clark Fork[b]	Copper Creek	136.9	Rock Creek

[a] Moved downstream over Milltown Dam prior to spawning

[b] Ascended a drainage different than the one in which it was released

[c] post-spawning mortality

[d] unknown

[e] harvested by angler

[f] Moved downstream over Milltown Dam after spawning

Table 2. Descriptions of length (mm), weight (kg), date captured, major drainage ascended, farthest upstream or spawning location, and distance (km) of that location from Milltown Dam (MTD) for radio-tagged westslope cutthroat trout (WCT) and bull trout (BT) 2001. All fish were released in the Blackfoot River at km 4.0. Fish numbers correspond to numbers in Figure 2.

Number	Species	Length	Weight	Date captured	Drainage ascended	Spawning location or upriver-most location	Distance migrated	Final location or fate
12[a]	WCT	406	655	6-Apr	Clark Fork[b]	Rock Creek	31.8	Milltown Reservoir
13	WCT	362	503	8-Apr	Clark Fork[b]	Deer Creek	3.5	Below dam
14	WCT	425	792	16-Apr	Clark Fork[b]	Deer Creek	7.0	Mortality[c]
15	WCT	412	775	18-Apr	Blackfoot	Gold Creek	27.8	Milltown Reservoir
16	WCT	417	747	18-Apr	Clark Fork[b]	Solomon Creek	37.8	Milltown Reservoir
17	WCT	415	658	25-Apr	Clark Fork[b]	Deer Creek	7.3	Below dam
18	WCT	440	822	25-Apr	Clark Fork[b]	Rock Creek	103.8	Clark Fork
19	WCT	405	604	25-Apr	Clark Fork[b]	Rock Creek	30.5	Below dam
20	WCT	380	470	25-Apr	Blackfoot	Monture Creek	100.5	Milltown Reservoir
21	WCT	417	680	27-Apr	Clark Fork[b]	Deer Creek	5.8	Below dam
22	WCT	364	485	27-Apr	Clark Fork[b]		8.4	Clark Fork River
23	WCT	350	426	4-May	Blackfoot	Gold Creek	31.5	Mortality[f]

24	WCT	355	444	6-May	Blackfoot	Gold Creek	44.3	Blackfoot River
25	WCT	375	460	9-May	Blackfoot	Monture Creek	89.2	Mortality[c]
26	WCT	426	697	9-May	Blackfoot	Gold Creek	28.5	Mortality[c]
27	WCT	350	406	9-May	Blackfoot	Gold Creek	43.3	Blackfoot River
28	WCT	372	460	9-May	Blackfoot	Monture Creek	80.4	Mortality[x]
B8	BT	600	2000	4-Jun	Blackfoot	North Fork	129.0	North Fork
B9	BT	545	1400	4-Jun	Clark Fork[b]	Ranch Creek	47.0	Mortality [g]
B10	BT	665	2800	4-Jun	Blackfoot	North Fork	127.2	North Fork
B11	BT	775	3900	15-Jun	Clark Fork[b]	Hogback Creek	77.4	Rock Creek
B12	BT	725	3300	17-Jun	Blackfoot	Monture Creek	95.5	Mortality[c]
B13	BT	620	2150	28-Jun	Blackfoot	North Fork	127.2	Milltown Reservoir
B14	BT	570	1540	11-Jul		Milltown Reservoir	1.0	Mortality[d]

[a] Moved downstream over Milltown Dam prior to spawning
[b] Ascended a drainage different than the one in which it was released
[c] Post-spawning mortality
[d] Unknown
[e] Harvested by angler
[f] eaten by northern pike
[g] entrained in an irrigation ditch

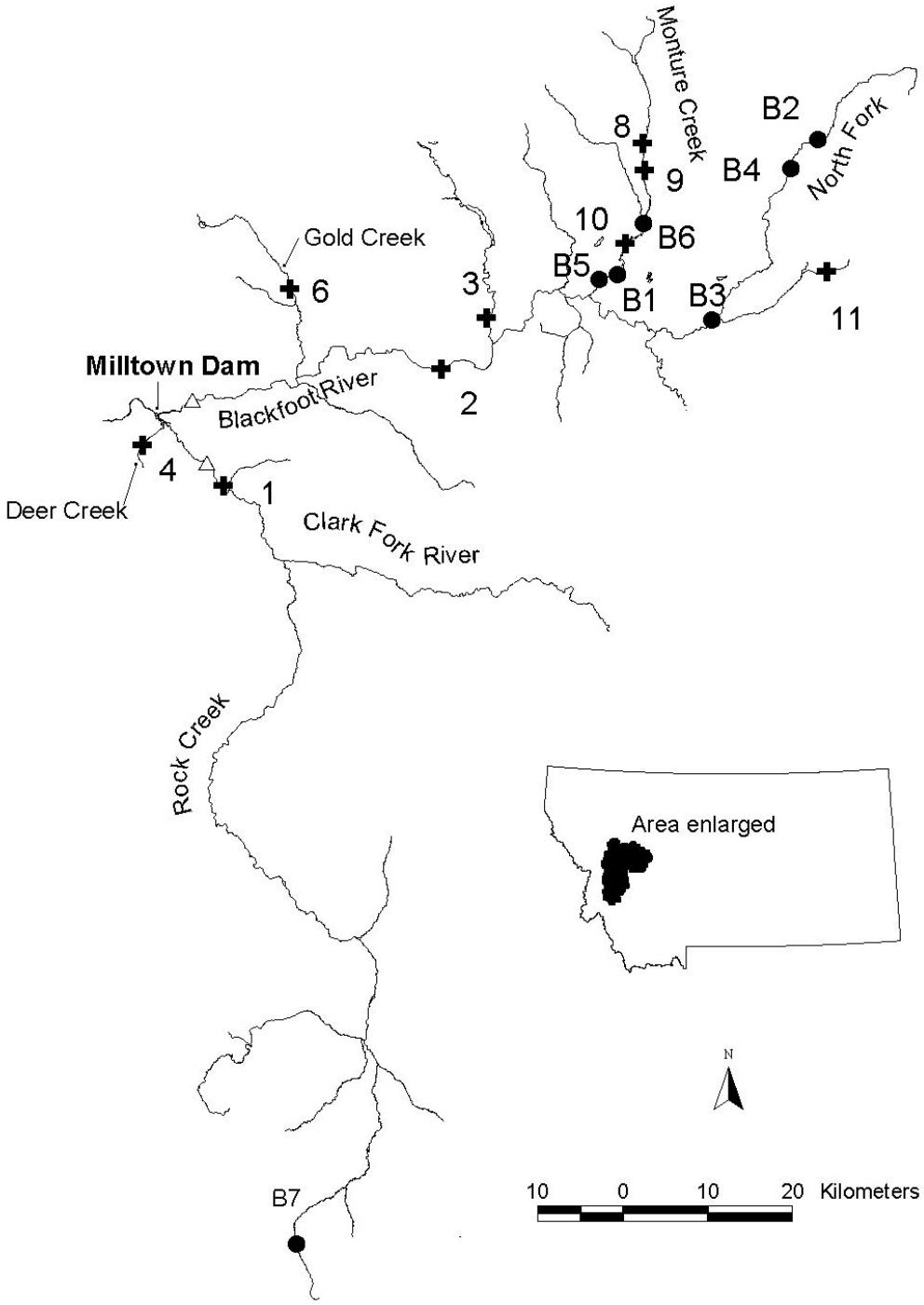


Figure 1. Upstream-most or spawning locations of radio-tagged bull trout (circles) and westslope cutthroat trout (crosses) after transport above Milltown Dam, Montana and release into the Blackfoot or Clark Fork river in 2000. Release locations are represented by triangles. The Blackfoot and Clark Fork rivers flow east to west; numbers and letters correspond to individual fish in Table 1.

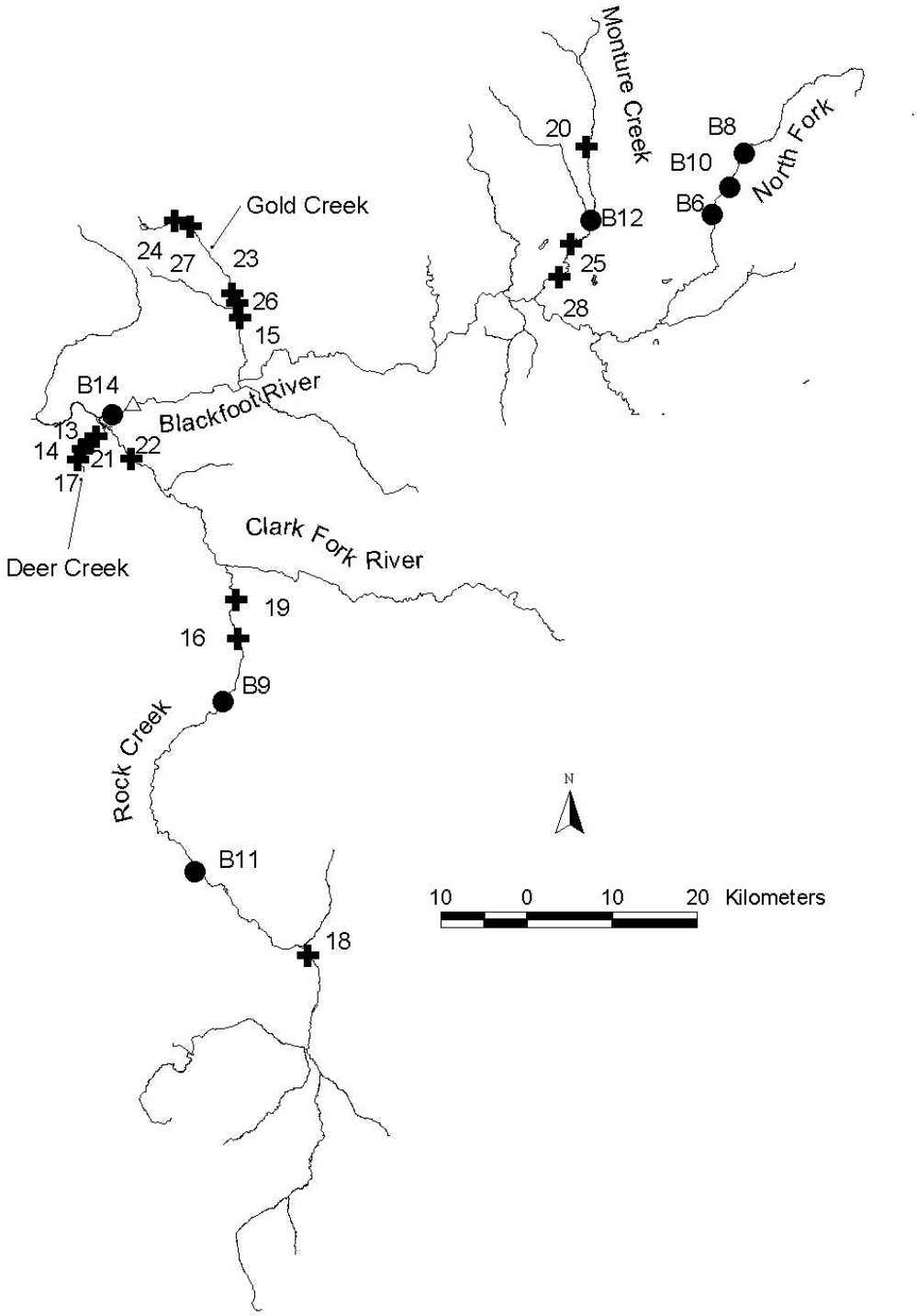


Figure 2. Upstream-most or spawning locations of radio-tagged bull trout (circles) and westslope cutthroat trout (crosses) after transport above of Milltown Dam, Montana and release into the Blackfoot River in 2001. The release location in the Blackfoot River is identified by a triangle. Numbers and letters correspond to individual fish in Table 2.

ADOPT-A-TROUT SCAVENGER HUNT

Using the "Adopt-A-Trout" website, navigate through and answer the following questions.

Fish Glossary Match:

___ **abiotic**	A. The small, rayless fin along the midline of a fish's back behind the dorsal fin. Often removed for markingand identifying.
___**barrier**	B. The non-living components of a fish's habitat such as substrate, large woody debris, shade and water quality.
___**caudal fin**	C. A type of structure that blocks migration.
___**adipose fin**	D. The tail fin on a fish.
___**telemetry**	E. A newly hatched fish which still has a yolk-sac.
___**tributary**	F. A method used to track animal movements that relies upon the detection of radio signals at specific frequencies.
___**alevin**	G. The way in which most fish reproduce.
___**spawn**	H. A stream that flows into or joins a larger stream.

Trout Trackers!

How many fish are currently being tracked? _____

How many currently have "names"? _____ List the names:

Check out each fish (even the ones without pictures) and collect data for the chart below. You may want to make tally marks in each category that applies as you scan each fish so you can answer the questions following the chart.

Fish (name or number)	SEX (circle)	WEIGHT	LENGTH	RELEASE

Are there more males or females? _____

Which fish is the heaviest? _____

Which fish is the lightest? _____

Which fish is the longest? _____

Which fish is the shortest? _____

How many fish were released in the Clark Fork? _____

How many fish were released in the Blackfoot? _____

Looking at the date above, is your fish one of the smallest? Largest? Or mid-sized? _____

At the bottom of the "Trout Trackers" page on the website is an article called:

"Cutthroat's untimely end underscores pike problem"

Click on it and read. Then answer the following:

WHAT? (what happened? Main idea) _____

_____

_____

_____

_____

WHEN? (when did this happen?) _____

_____

_____

_____

_____

WHERE? (where did it happen?) _____

_____

_____

_____

_____

WHO? (who did this happen to?) _____

_____

_____

_____

_____

WHY? (why do you think it happened?) _____

_____

_____

_____

_____

Bonus Question!!!!!!!
(Hint: Check out the glossary!)
What do the FWP people commonly use to anesthetize fish (put them to sleep) when they are working with them? _____

_____

_____

_____

_____

ADOPT-A-TROUT SCAVENGER HUNT II

Name: _____ Date:_____

1. Go to the Adopt-A-Trout website to find the following information: (http://fwp.state.mt.us/adoptatrout/)

   How many cutthroat trout are on the "2003 Fish" page? _____

   Fill in the chart below:

Trout's name	Adopted School	Day fish caught and transmitter placed

Fill in chart:

Trout's name	Last location she/he was found	SIZE of Fish Weight/length

Go to the "Radio Telemetry" page on the Adopt-A-Trout site for the following:

1. What is radio telemetry? _____

_____

_____

_____

_____

2. Why do biologists use radio telemetry in fish? _

_____

_____

Use the wax fish statues from Fish, Wildlife and Parks or detailed drawings provided by your teacher for the following:

What are the similarities between the 4 trout species (brook, bull, rainbow, cutthroat)?

What are the differences between the 4 trout species (brook, bull, rainbow, cutthroat)?

Choose two of the 4 trout species and do a detailed sketch of both below. Use good details and be sure to label fish:

_____ trout

_____ trout

NORTHERN PIKE ACTIVITY

PIKE WANTED POSTER

Please create a neat, creative, well thought out "WANTED" poster for the northern pike. You can use the information about northern pike your teacher gives you or found on the Adopt-A-Trout website (http://fwp.state.mt.us/adoptatrout/) to help you with specific details. You should include the following:

1. Each poster should have "WANTED" in large letters with "Northern Pike" below it.
2. A large northern pike drawn in detail.
3. Include on your poster the following information:
   Detailed description (what it looks like!)
   Habitat information (where it might be found!) including range (the area it covers), where it spawns, etc.
   Food (what it eats!)
4. Include at least 5 reasons why we care (why are we hunting it down?)
5. Include 5 ways the Department of Fish, Wildlife and Parks is trying to help the situation.

LEARNING GAMES

Want to be A Candyionaire?

$100: The last stage in the life cycle of a trout:

a. fry c. adult
b. spawning adult d. alevin

$200: All of these are problems for streams except:

a. pollution c. erosion
b. roads d. cool water

$300: A Cutthroat Trout spawns in the:

a. school c. Spring
b. Fall d. Disney Land

$500: A young trout that no longer has its yolk sac attached is called a:

a. fry c. adult
b. eyedegg d. alevin

$1000: A magnet does this to a radio transmitter:

a. shuts it off c. turns- it on
b. nothing d. makes it louder

$2000: The Riparian area found along the side of a stream contains shrubs, trees, grasses, and plants. This provides all but what for the stream:

a. Shade c. helps with erosion
b. Hiding places d. rain

Adopt-A-Trout
Weakest Link Game

1. Milltown Dam is this type of a dam. (Hydroelectric)

2. The Milltown Dam is located at the _____ of the Blackfoot and Clark Fork Rivers. (confluence)

3. The dam acts as a _____ to migrating fish that wish to continue up the river to spawn. (barrier)

4. Fluvial migration is when a fish migrates from where to where. (large stream to small stream to spawn and back to larger stream to live)

5. This device is implanted into many migrating fish species to track its movement. (radio transmitter)

6. Name one of the two types of "pools" we discussed on our field trip. (scour or plunge)

7. Shallow stream water flowing over rocks creates small ripples also known as this. (riffles)

8. What we call the vegetation/area surrounding a stream or river. (riparian area)

9. A plunge pool can usually be found underneath a small one of these. (waterfall)

10. Small radio transmitters surgically placed in trout can be detected by one of these. (receiver)

11. Aerial antennas establish listening zones for signals, where directional antennas usually pick up a signal coming

from a certain what. (direction it's pointed)

12. Clove oil can be used to do this to fish. (anesthetize)

13. This fin is fleshy and of little use to the fish. Often clipped off and used as a marking tool for fish caught at Milltown dam. (adipose)

14. Large Scale Suckers and Westslope Cutthroat spawn in this season. (Late Spring)

15. Bull Trout spawn during this season. (Fall)

16. Fish that never leave an area to spawn or for other parts of their life cycle, but remain in the same area for their entire lives are called this. (resident)

17. It is very typical for the coloration of a trout that is spawning to change. Their color usually becomes brighter or duller. (brighter)

18. The female trout makes a depression in the stream bottom, using her fins and body to move the gravel. She then lays her eggs and does this to them. (covers them)

19. During migration, fish that have radio transmitters are located on an average this many times /week. (3)

20. Chamberlain Creek is excellent spawning habitat for what fish that we've been studying. (Westslope Cutthroat)

21. Fish feed on aquatic insects. Name one we saw on our fieldtrip. (caddis fly, stonefly etc)

22.High water during spawning helps hide the large fish from predators and also this. (helps them navigate around

in smaller streams)

23. When trout return to the area they were born to spawn they are relying on instinct and predominately use this sense. (smell)

TROUT JEOPARDY

Note to teacher:
The following statements may be used in the Jeopardy Game format. We suggest that you cut out each statement and glue the answer to the back of it, copy them on stock paper and then laminate. Make a Jeopardy gameboard using large tag board and library pockets to insert your cards into. This game may be easily adapted and used for Pike by redoing the statements with the appropriate information. This is a wonderful tool to begin a fish unit (instead of the KWL chart) and a way to evaluate how much the student has learned at the completion of the unit.

A partially developed egg which show the embryo's eye.
(what is eyed egg)
Newly hatched fry, which still have the yolk-sac attached.
(What is alevin)?
The actual place where something lives that provides for each individual species needs for food, water and shelter.
(What is habitat)?

The way in which most fish reproduce; the female lays the eggs and the male fertilizes the eggs.
(What is spawning)?
The sac attached to a newly hatched fish containing a balanced diet for its early growth.
(What is yolk sac)?
The area found along the side of a stream that contains shrubs, trees, grasses, and plants.
(what is riparian)?
A nest in the bottom of a stream dug by a female fish.
(What is a redd)
Any naturally spawned fish belonging to a native population.
(What is wild fish)?
The process by which the belly closes once the yolk-sac is used up.
(What is button-up)?

The measure of acidity or alkalinity of a solution ranging from 0 to 14; 6.5 to 7.5 is the ideal range for salmon and trout.
(What is pH)?
A young salmon or trout approximately 3.5 inches in length.
(What is a fingerling)?
A young fish that no longer has the yolk-sac and leaves the gravel to seek food.
(What is a fry)?
A method used to track animal movements that relies upon the detection of radio signals at specific frequencies.
(what is telemetry)?
A stream that flows into or joins a larger stream.
(what is a tributary)?
FWP people commonly anesthetize the fish with this substance.
(What is clove oil)?

Shallow stream water flowing over rocks creates small ripples also known as this.
(what are riffles)?
This is a small radio surgically placed in trout.
(what is a transmitter)?
This fin is fleshy and clipped off and then used as a marking tool for fish caught by biologists.
(What is adipose fin)?
Bull Trout spawn in this season.
(What is fall)?
Fish will feed on this aquatic insect.
(what is caddis fly, stonefly, etc.)? accept one
A fish that completes its whole life in a small tributary stream.
(what is a resident)?
This fin is the tail fin on a fish.
(what is the caudal fin)?

This term is used to describe an unclear stream that is usually caused by sediment flowing downstream with the stream current.
(what is turbidity)?
This is when fish move from one area to another, usually, but not always for breeding reasons.
(what is migration)?
Stream features that is normally deep and wide, with slow water and no turbulence.
(what is a pool)?
A rubbing or scraping motion which causes cleaning or digging.
(what is scour)
A fish that hatches in a small tributary, rears there 1-4 years and then migrates out to a larger river to mature and at this point migrates back to the tributary to spawn.
(what is fluvial)?

The ability of an adult fish to locate where it was born and migrate back to this place to spawn.
(what is homing)?
This trout is olive to bluish on the back, silvery sides, a pink band on the sides from head to tail and has many small black spots on its back, sides, adipose and dorsal fin.
(what is a Rainbow trout)?
This trout has bright red streaks located on its lower jaw and is greenish-blue with silver sides and dense patterns of spots across the body and tail.
(what is a Cutthroat Trout)?

Adopt-a-Trout Survey

Name: _____

Please check √ one of the following boxes:

No Adopt-A-Trout experience □

1 year of Adopt-A-Trout experience □

1. What are two reasons that fish migrate?

   _____

   _____

   _____

2. Name one advantage and one disadvantage to migrating.

   _____

   _____

   _____

3. Why is it important for a fish to return to a stream, in which they reared, to spawn?

   _____

   _____

   _____

4. What is the legal status of bull trout and westslope cutthroat trout in Montana?

_____

_____

_____

5. Name three factors that lead to these fish having this legal status.

_____

_____

_____

6. How does Milltown Dam (or other dams) affect bull trout or westslope cutthroat trout?

_____

_____

_____

7. Name two reasons that invasive species are a problem.

_____

_____

_____

8. Name two reasons that native fish species are important.

_____

_____

_____

9. Circle fish native to western Montana

Rainbow trout
Brook trout
Bull trout
Westslope cutthroat trout
Brown Trout
Largescale sucker
Northern pike
Northern pikeminnow (squawfish)
Yellow perch
Mountain whitefish

10. Circle non-native fish (introduced) in western Montana

Rainbow trout
Brook trout
Bull trout
Westslope cutthroat trout
Brown Trout
Largescale sucker
Northern pike
Northern pikeminnow (squawfish)
Yellow perch
Mountain whitefish

FORMS

Teacher Name _____ **School** _____

ORDER FORM

ENHANCEMENT MATERIALS FOR THE ADOPT A TROUT PROGRAM

Notes: these materials may be ordered by return e-mail at dschiele@state.mt.us or mail your order to Dori Schiele, MT Fish, Wildlife, and Parks, 3201 Spurgin Road, Missoula, MT 59804, or by calling (406)542-5500 and asking for Dori.

Transporting the fish models and/or Bull trout Box **will be your responsibility.** Ask us when you order, because we may have someone traveling to or from your area that could help!

Materials Available	Description	#Ordered	Date Needed	Return Date
Bull Trout Box	Action Packer Box,, 27" X 18" X 19"			
	Fish redd photo			
	Stream gravel & write up			
1 per class	Bull trout video			
	Video of T.V. news stories on implant surgery			
	Spawning Bull Trout what we learned from radioed Bull Trout capturing cutthrouts at Milltown Dam. Preserved Fish, eggs, Fry with write up on early life stages of trout. Video & News Stories on Illegal Fish Introductions.			
	Mt Fishing Regulations, Fish ID quiz & Slides			
	Fish of Montana CD			
	Bobbers			
	Lucky Hooks			
Models of Trout in Plastic cases	Bull Trout			
	Bull Trout w/cutaway to show implanted transmitter			
Caution: These will melt if exposed to heat or Sun	Cutthroat Trout			
	Brook Trout			
	Brown Trout			
	Lake Trout			
1 of each per class	Rainbow Trout			
Kids fishing game to teach fish ID	Plastic fish with grommets			
	Line with a hook			

1 set per class				
Fish Identification Guide **1 set per class** **1 per student** **teacher keeps**	Color printed guide			Yours to Keep
Bull Trout Placemats **Average 3 or 4 per student**	Info & fun activities on Bull trout Kids take home one for each family member & offer to set the table!			Yours to Keep
BULL TROUT - further Adventures of a Travelin' Fish **1 set per class** **1 per student**	Reprint of MT Outdoors Magazine Article			Yours to Keep
Bull Trout pocket ID guide **1 per student**	shows Bull, Brook & Lake trout			Yours to Keep
MAY CLUB applications **1 per student**	Kids (k-4) Montana Angling Youth Club. Free membership			Yours to Keep
Posters **1 of each per class**	Benthic Macroinvertebrates			Yours to Keep
	Anatomy of fish			Yours to Keep
	Whirling Disease			Yours to Keep
	Fish of Montana 1of 5			Yours to Keep
	Fish of Montana 2 of 5			Yours to Keep
	Fish of Montana 3 of 5			Yours to Keep
	Fish of Montana 4 of 5			Yours to Keep
	Fish of Montana 5 of 5			Yours to Keep
	Native Montanans-stickers			Yours to Keep

We also have trained Youth Angler Instructors that can visit your class and work with your students on a variety of fish related topics. Call Bill Thomas directly if you are interested, 542-5500.

We have an aquarium - loaner program, where we bring fish, bugs, tank equipment, etc. and an instructor to your class. Call Bill Thomas directly for this opportunity, 542-5500.

We have for loan 400 spinning rods & reels, fly rods & reels, fly typing equipment and supplies. Contact Bill Thomas directly.

If you want to take the class fishing, we will help.

IF WE NEED TO DISCUSS YOUR ORDER, HOW & WHEN SHOULD WE CONTACT YOU?

Name _____ Phone# _____

When _____

Dear Parents,

I want to keep you up-to-date on our Adopt-A-Trout project and share some information that you can use to participate from home if you would like!

We have adopted a fish with a radio transmitter. Our fish, a _____, was captured and tagged on _____. You can find out more about it and follow its movements on the Web at http://fwp.state.mt.us/adoptatrout/.

The students work on curricula, related to the program, that use math, science, language and art skills. Our goals are to learn about fish biology and management, river ecology, and how scientific research is done.

I hope you will contact me if you have any questions about this project, and I encourage you to find out as much as you can about what we are doing through the website and by asking your child to describe his or her experiences.

Sincerely,